THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c.,

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

VOLUME ONE.

FROM JULY TO DECEMBER, 1853.

NEW-YORK:
PUBLISHED AT 142 FULTON-STREET
John F. Trow, Printer, 49 Ann-street.
1853.

THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. I.—JULY, 1853.—No. I.

Art. I.—INTRODUCTION.

When the miner sinks his shaft into the bosom of the earth, penetrating the unstratified rocks, which like walls of adamant forbid his progress, unheeding the floods of water pouring upon him from above, or the springs which gush up at his feet, fearless of the darkness gathering faster and faster as he advances, or the deadly vapors which begin to float thickly around him, it is to obtain the iron, the coal, the copper, the silver and the gold which have given to the hand of man such an invincible dominion over the physical world. These wonderful treasures, imperishable as the eternal hills, congealed in the hardest rock, made pliable only by the all-devouring element of fire, have given him strength to subject all nature to his use and pleasure. Those heroic spirits who first gathered the metals and worked at forges in the childhood of our race, were esteemed as worthy to be second only to the gods, and the fruits of their labors were called "thunderbolts" of power. Their names have been enrolled in the sacred annals of men.

The nation with a fertile soil and inexhaustible mineral treasures, possesses elements with which a hardy people may aspire to supreme command over mankind. Our country presents all which the most stupendous ambition could desire, its boundaries are enlarged to the utmost limit; its soil yields the productions of almost every zone, and all our national energies have been exerted in their cultivation and diffusion. Our commerce is sprinkled on every sea, and our flag floats in every breeze. Has not the time come for us seriously, and in full strength, to attempt the exploration of our mineral treasures? Apart from the allurements of gain, has it not become a duty, resting on us, now to enter extensively upon the development of these hidden

stores, and pour them into the treasury of the world, thereby to promote the comfort, increase the happiness, and aid the improvement of the mass of mankind?

The rapid progress of geological science has rendered essential service in the development of the riches within the earth. It is at once its object and boast to redeem the search after metallic ores from the hazard which in times past attended it; to teach the miner to discard the belief in sinister influences, and evil spirits, by showing that these substances have not been distributed by chance, but that each is referable to some peculiar geological deposit; to direct the inquiry for them upon fixed principles, and in conformity with the laws which regulate their occurrence.

If we suppose a shaft to be sunk, or a perpendicular excavation made into the earth, upon the border of an extensive plain, skirting a mountainous district, it will first pass, for nearly a hundred feet, through layers of loam, clay, and sand. This deposit from an existing river is denominated *alluvium*, being the earth resting upon the rocks. The second formation succeeds, which is called *drift*, or *diluvium*. This is composed of coarse sand and gravel, with fine sand, containing large rounded masses of rock called boulders. The third series of strata through which the shaft penetrates is composed of layers of clay, sand, gravel, and marl, with occasional beds of quartz and limestone. They contain many petrifactions and are usually horizontal; they are all called *tertiary*. After these come the *secondary*, composed chiefly of solid rock, mostly made up of sand, clay, and pebbles, cemented together; in this series of strata are found many remains of animals and plants, greywacke, limestone, sandstone, coal, lias, clay, marl, green sand, and chalk. Beneath these are the *primary rocks*, which are destitute of organic remains, and have a structure more highly crystalline, and are inclined at a greater angle to the horizon. Here are found granite, gneiss, mica slate, limestone, gypsum, talcose slate, hornblende slate, quartz rocks, and clay slate.

It is in the primary and secondary rocks that metallic veins are most numerous. Copper is found in the greatest abundance in granite and in the schistose or slaty rocks above it, although it also presents itself, but in less abundance, as high in the secondary series as the new red sandstone. Lead is chiefly confined to the carboniferous limestone, it is often associated with the ores of silver, but more commonly with those of zinc, copper, and iron. Silver is mostly found in the primary and secondary rocks, and, like many others, occurring in veins which sometimes communicate with fissures beneath, and have probably been occasioned by deeply-seated subterranean agency. Gold offers an exception to the

general rule of metals existing in veins; it is disseminated in minute quantities throughout those rocks (usually of a quartzose character) in which it occurs, and is chiefly obtained in alluvial gravel resulting from the decomposition of such rocks, or from the sands of rivers which, flowing over them, have washed out the particles of gold. It is in the alluvial soil on the banks of the Sacramento that the rich gold washings occur, which have attracted so many to the shores of California. Platinum, together with zircon, the diamond, and many other gems, is also found in alluvial deposits, their original source being, probably, the same as that of gold, while iron is usually found associated with coal and limestone, without both of which substances it would be almost impossible to reduce this valuable ore to a metallic state.

There is a mineral substance which, by some, may be regarded as more precious than gold or silver, the occurrence and profitable discovery of which geology is able to determine, and that substance is coal. If the mines of the precious metals were closed at once, and gold and silver no longer obtained for use, mankind could, after some considerable revolution in adopting other representatives of value, progress nearly as before; but deprive civilized communities, especially those of the Old World, of their coal, and it would be a catastrophe almost fatal to their welfare and happiness. From that moment when her supply of mineral fuel was exhausted, and her last coal-field consumed, would the future historian of the revolutions of empires, date the decline and fall of Britain's power. No longer would she be the great factory of the world; no longer would she triumph over time and space, and traverse, like ourselves, land and ocean, with a rapidity almost incredible; her steam power would be annihilated, and with it her prosperity and supremacy as a nation.

The importance of developing the deposits of mineral treasures, requires no argument at this day. It only remains to speak of the part we propose to take, in connection with a subject of such extensive magnitude and national interest. And here we would prefer to be judged by our deeds. If we can aid to extend the interest felt in this branch of industry, to diffuse both scientific and practical knowledge, to point out the dangers and shoals to be avoided, to make known the labors and the worth of those who, unnoticed and unknown, have toiled in this field, and given the fruits of their diligence to mankind; or if, in a word, we can add in any degree, by our efforts, to the mass of national wealth and happiness and prosperity, our enterprise will not be in vain.

Every subject which can be interesting or useful to those engaged in mining, or in the manufacture of metals, or trading in ores and other minerals, will be embraced from time to time; for

it is our intention to render the Mining Magazine a standard work on the subjects to which it will be devoted, independent and impartial, so that it may be referred to with certainty and confidence, for counsel and direction on all the topics of which it treats. The state of mining operations, both American and Foreign, will be illustrated with neatly executed cuts, and we are happy to add, that we have secured able and talented co-operation, both at home and abroad.

It will be at all times grateful to us, as proving an interest in our success, to receive communications, or information, from practical and scientific men, which will be inserted as far as our limits will permit; for, as by collision of flint and steel light is extracted, so from the intercourse between mind and mind truth is elicited, and an impulse given to research and effort.

Art. II.—GEOLOGY OF THE SIERRA NEVADA, OR CALIFORNIA RANGE. By Prof. John B. Trask.

GEOLOGICAL REPORT.

To the Hon. J. R. Snyder, Chairman of the Committee on the Geology of the State.

Sir:—In compliance with the resolution of the Senate of the State of California, passed March 26th, 1853, calling upon me for such information in relation to the geology of the State as I may possess, I have the honor to transmit herewith the following Report on the Geology and productive resources of the State, that have fallen within the line of my reconnoisances, which line is embraced within the 36th and 42d degrees of North latitude.

John B. Trask.

[The Report commences with some remarks upon the course of the mountain ranges of the State, and the comparative antiquity of the various deposits in the valleys, which we omit, as being of a general nature, and tending to extend this paper to a length too great for an insertion at once in our pages. It then proceeds as follows:—*Ed. Mining Mag.*]

The district of country lying north of the 40th degree of north latitude, much resembles, in some particulars, portions of the south; but it presents withal, stronger evidences of greater antiquity than the southern, in many of its parts; and portions of it were probably contemporaneous with the district south of 40 degrees, although there is no probability that all of that section can claim contemporaneous origin, for if it did, its formations

should in some degree correspond; whereas, on examination, we find discrepancies that would seem to warrant us in referring them to another period.

A convenient way, then, would be the arrangement of the mineral district into three classifications, making in these, such subdivisions as may be necessary; and under this plan they would present themselves in the following order:—

First.—Primary, or central districts, included between latitude 38° 30′ and 40° north.

Second.—The northern district, included between 40° and 42° north.

Third.—The southern district, included between 38° 30′ and 36° north latitude.

I feel fully confident that whenever this State shall be authoritatively examined, that a similar arrangement will be made, both for convenience and elucidation.

Under this arrangement, then, I shall speak of the various districts in the order in which they occur.

FIRST, PRIMARY DISTRICT.

This name may be applied to this section with strict propriety; first, from the character of its rocks, and, secondly, from their distribution and association.

The rocks that compose this district are for the most part primitive, in a geological sense, being composed of granite, porphyry, trap, and other allied rocks, among which the serpentines form no unimportant part.

The rock that first emerged was undoubtedly the granite, which was ejected from beneath, and protruded through the slate, and in many instances presents all the appearances of having flowed over the sedimentary formations; in other cases it is protruded as a single dike, often of miles in extent, with lateral veins extending into the adjoining rocks.

The next class that claims our attention is the metamorphic (changed) rocks, many of which, through the agency of volcanic heat, have become true porphyries; they are largely developed on the banks of the rivers of the country, and are a great source of annoyance to miners engaged in river mining, as they are extremely tough and difficult to break.

Closely associated with these, are, occasionally, veins of the original clay slate, from which these porphyries have been formed, holding different grades of induration, passing from a fissile clay slate into a compact rock, often in the distance of a few yards.

The serpentine rocks are next in order of the volcanic group; they are generally intrusive rocks, and are widely distributed throughout the country, and many of them present distinct lines

of stratification. They have received different names from the different forms they assume; some of them being true shales, of various thickness, consistency, and composition; but all of them, in whatever form they may be found, have but the one origin (volcanic), though they may receive many modifications from subsequent causes.

These rocks, when found in the form of slates particularly, are entitled to more consideration than has been bestowed upon them by the mining community, as repositories of the precious metals.

It is to this class of rocks that we are, in a great measure, indebted for those valuable deposits of gold which the slate contains, as well, also, as the auriferous quartz veins with which they are so frequently combined. It was on these rocks that one of the greatest geologists of the age (Mr. Dana) based his opinion on the probable value of this State as an auriferous district long before the discovery of gold; and subsequent time has demonstrated how correct and just were his opinions; and yet public opinion, even at this time, has neglected to take cognizance of this class of rocks, so far only as accidental circumstances have thrown them in their way. I think that no hazard would be incurred by expressing the opinion that this class of rocks will be found, in many cases, the prolific sources of wealth in the future, equalled only by the auriferous quartz, and excelled by none. This class of rocks, or those known by the name of chlorite, which is but a variety of this group, is represented in Mariposa county, at the locality known as Bear Valley; and a sufficient illustration of its value will be found in the excitement that prevailed on its discovery. Moccasin Creek, four miles south of Stevenson's Bar, Tuolumne county, and river, is also another point at which they may be studied with advantage.

These are but two of many instances in which the auriferous deposits have been developed in this class of rocks; and when found, it is as much an integral of the formation containing it, as the thread of gold that permeates the vein of quartz.

In addition to its containing gold, as an integral part, when unassociated with the veins of quartz, it frequently becomes the retaining medium of this metal when in contact with those veins. Hence has arisen much loss to parties who have engaged in that latter branch of industrial employment, from the neglect of attention to this important point; but we shall advert to this point more particularly when the subject of Quartz Mining engages our attention.

The sedimentary rocks of this district are of three kinds: 1st. Argillite Slate (clay slates); 2d. Conglomerates (pudding stone); 3d. Sandstone; the two last occupying the smallest area.

The sandstone formation is evidently the most recent of this group, and in some parts of this district is fossiliferous—this being the only point of importance attached to it, and this only in a scientific point of view; as a matter of economy or practical interest it will not, therefore, claim our further attention.

The principal localities in which it is found to contain imbedded fossils, are upon the Butte and Chico Creeks, and near Rich and Reeve's Bars on the first-named creek, and the fossils are of the *Miocene* period, and the bed of sandstone rests on a metamorphosed slate, which is in some parts porphyritic.

The argillite rocks of this district will command our attention before either of the other members of this group; it is superior as a member of the group, though it is inferior as to position. The degradation of those rocks forms an important feature in the characteristics of the valley bottoms, and a sparsity or surplus of its debris, would, as a consequence, enhance or diminish the capabilities of the soil for agriculture; hence an attentive examination of the valley sections is imperatively demanded. It has been suggested within the past year that a large portion of this group will, at some future day, be mined for the gold it contains, mechanically, as well as other rocks that contain this metal as an integral. How soon this may take place it would be improper to suppose at this time, but the premises upon which the suggestion is based are tenable.

The conglomerates of this district will next be considered. These rocks toward the valley appear to be coextensive with the argillite, and from their position, it is inferred that their formation was posterior to the slates; in the more mountainous districts they appear in isolated masses and in small patches, rendering their study less certain. In the lower foot-hills, in many places, the group *in situ* is wanting, and in its place low, rolling, gravelly hills are the only vestiges that mark the localities it formerly occupied. The cause of this absence in the group is found in the outcrop of heavy masses of trapean rock near the borders of the valley in these sections.

These older conglomerates have but little interest connected with them, further than geological position is concerned, except the modifying influence they exert through their debris on the formation of the valley sections; but there is a belt of these rocks in other parts of the country that will be entitled to much more and particular consideration.

Having described the principal rocks of the primary district, we will now pass to the consideration of the rocks of the northern district. To avoid repetition in our subject, in relation to its rocks, we will now state that, in addition to those noticed in the primary, the northern section contains some few that

should command attention in an economic view, so far as relates more particularly to their prospective value.

The first of these rocks that will claim our attention, is a hard silicious rock, known by the common name of millstone, but in technical language *Buhrstone.* This rock abounds on the Pitt River in large quantities, and also on to the north of Goose Lake; its admirable adaptation to milling requires no comment. The value of this rock cannot be too highly esteemed in this State, where the prospective is so flattering of its becoming a grain-growing country, equalled by few on the Atlantic slope. The heavy expenses that are now incurred, and the future wants of the State in this particular will be obviated, and our dependent condition on foreign imports destroyed. These rocks have as yet attracted little notice, but the rapidly increasing wants of the State will ere long bring them into requisition. In addition to the buhrstone of this district, this section of the country contains some few traces of the secondary rocks, a suite almost entirely wanting, with this exception, in this country, so far as at present explored.

The existence of any portion of this suite should command our every attention; and any measure that will be likely to develope this formation, or any part of it, within the limits of this State, should meet the approbation and support of the community at large. The importance attached to this group at the present time in this country is found in the fact, that it is to this suite that we must look for a home supply of the mineral coals, if ever found within the limits of our State.

As these rocks (in form of secondary conglomerate) have exhibited themselves in the northern district, and in those parts of the section most immediately connected with the coast line of mountains, it is to be hoped that judicious explorations in that range may develope its existence either near those points alluded to, or in other and more distant parts of the range.

From the structure of the country, it is to be doubted whether any other position than the above-named presents the slightest ground for hope that this necessary material of comfort and economy will be found in other parts than those indicated; every effort, then, compatible with prudence, should be made that will tend to elicit information on this important topic.

The frequent discovery of small patches of the mineral coal in those mountains, would seem to lend aid to the suggestion that its development in this range may be looked for with more confidence than at any other points, and a judiciously conducted examination is the only means that can be confidently looked to for this desirable end.

Aside from the two points alluded to, the northern district

comports itself in the major part of its formations with the primary district, and varies from it only in a few minor particulars noticed in the sequel.

SOUTHERN DISTRICT.

This district, according to our arrangement, is included within the thirty-sixth parallel and thirty-eighth degrees thirty minutes north latitude, and includes all that portion of the country denominated the Southern Mines, as well also as its valleys. The southern district, like the other two, contains many rocks in common.

In addition to these, there are also other formations, which differ widely from either of the other districts, which we shall notice in the same manner as heretofore, as our limits will not permit otherwise.

The first that will claim our attention will be the principal volcanic rocks, and among these the basaltic rocks will find the first place. It has been observed that the northern and primary districts contained these rocks, and it must now be noticed that the southern section contain them in a pre-eminent degree, compared to either of the others. Their principal northern outcrop commences near the sources of the Mokelumne, and extends almost uninterrupted for seventy or eighty miles south, having a mean breadth of ten to fifteen miles, and frequently extending much farther to the west, even to the foot-hills in some cases. The hills on the borders of the valley west of the Bear Mountains, Calaveras county, furnish an instance.

These rocks are well developed about the region of Bear Valley, Mariposa county, on the ridge to the east of this locality. At this place they may be found in several of the forms they assume,—as the dolorite amygdaloid, columnar basalt, and greenstone.

The effects of such large masses of volcanic rocks on the sedimentary formations through which they have protruded has been great, as would naturally suggest itself, and we find many of those formations completely metamorphosed, as might be anticipated. The rocks are entitled to consideration in two points particularly. One is the results that are likely to ensue from the passage of these rocks through the sedimentary formation, and is the production or development of mineral veins, consisting most commonly of the metals, copper, silver, &c. It is generally true that these are most abundant in the older system of rocks; but this is not always the case.

By close examination of the mining districts of the world, our best geologists have announced the fact, that rich metallic

districts are dependent on the proximity of igneous rocks and axes of disturbance among sedimentary formations, and every subsequent observation has tended to confirm the theory.

On comparing metallic accumulations among the igneous rocks, it is found they are the most abundant in the underlying porphyries, amygdaloids, and trap rock, as well also the syenites. This condition, and the probable value of these rocks as a future source of wealth, will be fully comprehended when we observe that the metalliferous regions of the Andes are of this same character, and the outbursts of trap through its tertiary formations, are but a simple illustration of the condition of our own.

The second point of general importance in relation to these rocks, is their value in modifying, from their composition, other earths with which they may be combined. Too much importance cannot be attached to this point, for it is through this agency that a large portion of our soil is rendered valuable for agriculture; and I hope I may not be charged with sectional feeling when I say, that in this lies one of the grand secrets of the superiority of the bottoms of the southern sections, coupled with the debris of the calcareous formations which also lie to the east of these valleys.

The next important volcanic product that will claim our attention is the large extent of volcanic tufa that covers superficially an extensive area of country in its aggregate.

This tufaceous deposit becomes most fully defined as an overflowing mass on the ridge that forms the south bank of the Mokelumne, and is found in nearly all the districts to the east and south as far as the Stanislaus. It was very properly denominated a volcanic brecia by Mr. Tyson, on the first-named ridge, though in other sections it loses this character. This deposit covers the diluvial drift in many places, as well also the large mammalian remains that have been exhumed within the last two years. It is interesting and important, as it points to volcanic action at a comparatively recent date.

Since its deposit, strong floods have operated in these sections (which were probably pent-up waters, forming lakes in the interior), as the outliers of the surrounding hills fully indicate, as well also as the extensive table-lands that formed their shores. The towns of Vallecito, Murphy's, Douglass' Flat, and the vicinity of Sonora, furnish most admirable examples of the former existence of lakes in these sections. This tufa overlies the drift that contains the auriferous deposit of these placers, to the depth, in some cases, of one hundred feet, and even greater.

Primary Limestone.—Notice of this rock has been deferred until this time, from the fact that it occupies a much greater area in the southern sections. Its extent may be said to be

included between the American and Merced Rivers, and following a line deflected but a few degrees from the parallelism of the chain; this line is not continuous, but is broken at short intervals, at times by the intrusion of volcanic rocks, at others being covered by alluvium in common with the covering of the hills.

Its situation appears to be not far from midway between the foot hills and summit proper of the range.

This suite of rocks has been tapped in many points, and a highly remunerative business is now conducted in preparing lime for the market, and its finer qualities for ornamental architecture. This formation is capable of producing varieties of marble that it will be difficult to excel from almost any part of the world. The town of Volcano, Calaveras county, affords a wide field for operation in this branch, and the beauty of the Ringgold marble requires no comment at this time.

There are many other places, too numerous to mention, in which a profitable business can and will be conducted in this branch of industry. Some portions of the more northern sections contain this rock in quantities sufficient for all the probable prospective wants of these sections. It is found in the Yubas, near the Slate range, and on the Feather River, near the Rich Bar, and Sucker Ripple, and also in other localities in these districts. The Salmon, and other streams in the extreme north, also furnish it.

The southern district contains also a very recent conglomerate, the disturbance of which was probably attributable to the more recent convulsions that have been in action in these sections. It possesses but little interest, further than the testimony it may furnish, in a scientific view, in elucidating the early and later history of this portion of the continent; it will, therefore, be dismissed with this brief allusion.

Recent Sandstone.—Between the Merced and Tuolumne Rivers there exists a bed of recent sandstone, which is probably nearly or quite contemporaneous with the last-named conglomerate. This formation underlies the principal portion of the ground between those two rivers for a long distance to the west; hence during the rainy season this district is much more firm and dry, and it is a point eagerly sought for by the teamsters at this season, and for the most obvious of reasons. It finds a place in this report more for the purpose of illustration than otherwise, and also as a recuperative agent for some points of the adjoining districts, to be spoken of under the head of agriculture.

In review of the subject before us, we find that there are evidences of at least three successive periods in which this portion of the continent has been involved; the three periods of upheaval being interrupted by long periods of repose.

In the *second* upheaval the larger portion of the extreme northern district was developed, which was, probably, nearly contemporaneous with the development of the south. A long interval of quiescence is here manifest, during which the land became inhabited by mammals of varied species.

In the *third*, we find that these species were obliterated, and their remains lie buried beneath the evident causes of their destruction.

Fourth. The granite appears to have been the first of the volcanic group, and that it broke through the slate. The other trapean rocks appearing within the latter part of the first period.

Fifth. The older granite appears disturbed by more recent rocks, as well also as by more recent granites of the same species. In this particular the granite suite resembles the Heidelberg, presenting three distinct veins of different ages.

Sixth. The serpentine rocks—many of them appear to have been contemporaneous with the second period of disturbance, as is shown by their cutting through the older rocks.

Seventh. We are led to infer, from the manner in which the trapean and other volcanic rocks have forced their way through the sedimentary formations, that these rocks must prove metalliferous, as analogy and experience have proved in other parts of the world. Time will not permit to discuss the local geology of the State in a separate and distinct subject ; it will, therefore, be considered under the head of Mining Resources, which we shall now attempt to elucidate.

MINING RESOURCES.

Under this head will be included all those branches of employment within the district alluded to, as well also as those which must, from the nature of attendant circumstances, find a place in the history of our resources.

First in order will be the mineral lands, or those which contain gold. These will be divided into two classes :—First, those at present occupied ; and Second, those unoccupied, and, from present circumstances, unavailable.

The first class comprehends all those lands within the mountain districts which are situated on the rivers and higher valleys, also in the ravines and mountain gorges of the western flank of the range.

The range that they occupy through the country may be approximately stated to be not far from 50 miles in breadth by about 350 in length ; a small proportion of this, however, can be considered mining ground—probably about one-third. Within the mining districts proper there are large quantities of land which are known to contain gold, and in quantities sufficient to

warrant considerable expenditure of capital for the purposes of mining in future. These lands are not, at the present moment, available, from the want of that necessary agent, water; and it remains but to be seen that capital investments in hydraulic operations in this country is a safe and profitable source of income, and the unemployed moneys of the Atlantic States, Europe, and our own State, will seek and find a ready market in the various branches to which this source of profit will give rise. A longer period than the present year will not be required to demonstrate this fact, either for good or ill. The present year will be productive of results that cannot fail to convince the most incredulous of the value of those untouched resources of which it has been our pride to boast, and in the full consciousness of truth. Nearly all those companies that are at present in but partial operation, have demonstrated the utility of the system; and from what we have already seen, even in their immature state, we may confidently anticipate what the future will be when those operations arrive at completion. Should they prove of one half the value they now promise, the area within the mineral districts proper that would be open to those operations, now unemployed and useless from the want of water, and which are known to contain gold in profitable quantities, will nearly equal the present area employed.

It will require, then, on these premises, no great tension of the imagination to discern, that within the next two years our mining sections must contain a population full one half greater than they at present occupy. This estimate is exclusive of those discoveries which have been made within the last six months, and which only confirm the opinion formerly entertained, that the placers existed in sections remote from those now known. These later discoveries are situated mostly in the northern district, and the only obstacle presented to their profitable occupancy is large numbers of hostile Indians in these vicinities, particularly in and about the regions of Pitt River. It will be sufficient to state, that the unoccupied placers within the mineral districts proper are coextensive with the mineral range now occupied. This unoccupied mineral land may properly be divided into two distinct sections, and to this second section we would now call your attention.

SECOND SECTION.

This district of country is situated in the lower foot hills, and immediately on the eastern edge of the valley; it maintains a very uniform width of about four miles, and is almost uninterrupted throughout the principal portion of the valley district. A large part of the mineral section of Sacramento county is a

true example of these sections, though the principal range alluded to is a short distance west of those parts in which mining operations are conducted in this county at the present time.

This district is strongly marked throughout its entire extent, and the transition, either from the valley or mineral district proper, is such as cannot fail to attract the attention of the most careless traveller in passing over it. It will recur to the mind of every one who has passed from the rivers to the interior, that at the distance of some 12 or 14 miles from the streams, that you enter very suddenly a district thickly covered with *angular* pebbles of quartz; the district is scarcely less than two miles in width in any part of it, and in some localities much wider. On reaching the eastern verge of the valley, the transition is equally sudden as in the first instance; the *angular* pebbles disappear, and a few round pebbles, mixed with alluvium, replace them, for a short distance, which is immediately succeeded by the outcrop of what has been denominated the "*gravestone*" slate, from the appearance they present of a ruined churchyard, in nearly all the lower hills on the eastern edge of the valley. From what the author has seen of this district, I feel no hesitancy in saying that it must in a few years become the field of busy and extensive mining; and I think this opinion will meet the concurrence of those persons who are intimately acquainted with the localities named, and engaged in these operations at the present time within their limits, although these operations are comparatively limited at present. Rhodes' Diggings, Sacramento county, and Ousley's Bar, Yuba county, are on the eastern verge of this range, and Neal's Diggings, on Butte Creek, Butte county, also; and to those who are acquainted with these localities we would respectfully submit the opinion advanced.

It is not to be understood that this section of country will prove so highly productive in a short space of time as the more superficial and richer deposits of the interior sections, nor can it be, with any degree of propriety, expected. But, as a compensatory principle, they will possess the double advantage of being much more accessible, and yielding a lower but far more continued remuneration for labor, and a surer prospect of success. A more healthy and stable condition of the mining population will be the result of bringing these lands into successful operation; a desideratum much desired in this country

THE QUARTZ FORMATION.

This subject will next claim our attention, and our brevity on the subject will be found in our limited time.

In speaking of the rocks that compose our mountains, this formation was intentionally omitted, and a brief description of

this group, therefore, will be given at this time. The quartz formation forms an important point in the various groups that abound in this country; not so much in proportion of its masses, as they are small when compared with almost any other member of the plutonic series. The comparative range of country which they pass through cannot be considered as amounting to more than one-twelfth (1–12) of the width of the mountain range. The area that they occupy is also very small, compared to the rocks they pass through, being composed of small veins and dikes, cutting other formations, both igneous and sedimentary. The largest masses of the rock are found in the form known as *dikes*, which are at times nearly continuous above the surface for miles, in other cases interrupted on the surface at short distances. The largest dike ever observed by the author did not exceed forty yards in width, while the principal formation adjacent, and through which it passed, was nearly as many miles. It must not be understood by this that the amount of its aggregate is trifling, except in a comparative view with other formations, for its veins are found in most of the other rocks of the country, and as variable in size as in number.

These rocks throughout the country present many and distinct phases. On close examination they are found to be a disturbing and intrusive rock; while, in other cases, a feature the reverse is presented, they being disturbed by other rocks; and still another feature is often present, and frequently in the same locality; thus it is that some veins appear to have been unaffected, while adjacent veins are much disturbed and broken down.

With these premises before us, it would seem impossible to refer the entire group to one period, for the facts presented would remain unexplained, while many of the attendant discrepancies that have attached themselves to those operations which have resulted in loss and disappointment to the adventurers in this branch of mining, will, in a great measure, be found referable to these probable differences in the ages of these rocks.

I flatter myself that this opinion will be sustained ultimately, if not at present, by the community at large, and by scientific miners of other countries, as well as by subsequent examinations in this country.

The opinion that all metallic veins are referable to one age, which was formerly entertained in England, is fast losing ground before the march of scientific research, and the practical miners of this country now study the relative age of the formation, and form their estimates of its value very much on this basis.

It is found that there are eight distinct series of veins in some of the mining districts of England, and that these veins

vary in value according to their relative age and position. It is made a practical point of examination before entering on mining speculations in this country, to ascertain the relative age of a metallic vein before entering on the enterprise of extensive operations. We would, therefore, suggest the following proposition in relation to the auriferous veins of this country.

That the value of these veins will be found in the relative age which they maintain to the rocks with which they are found in connection, being modified as their passage is found to be through igneous or sedimentary rocks.

This suggestion is made in the hope that less disappointment may be experienced by those who seek a profitable and laudable employment in those branches of industry, and also to check, in some measure, those hasty and inconsiderate generalizations that once promised to blast the most brilliant prospects of the State. Two years since, this opinion was maintained and also made public, and the estimate then made of the probable fate of a large portion of those who had embarked in these speculations was predicated, in part, on these grounds. How far that prognosis has proved true, the public can best judge. Another, and an important point in this subject, is the association of the metal with other minerals in the vein. A large portion of the gold in these veins is frequently combined with other minerals, most of which are of a compound character—as the oxides of iron, and also its sulphurets (pyrites).

It must be seen, then, that one general and indiscriminate treatment of ores must not only prove annoying in the results that are obtained, but highly disastrous in the extraction of the metal, for the process that would relieve the metal in one case, would only serve to fix its investing matrix more closely in the other. Hence has arisen much of the discredit to this branch of mining, and pecuniary loss. This has been sustained from the neglect in making the necessary selections of ores from the same vein, and applying the same treatment for each variety. The experience in this branch of mining of the past eighteen months, has demonstrated too truly and sadly that those methods heretofore adopted cannot be pursued with profit, but on the contrary, that certain loss must be the result of this system, too hastily entered upon, and too thoughtlessly pursued in whatever branches of industry it may be applied.

But, from the failure that has been experienced in this case, it would be unjust even to infer that these metallic rocks do not possess the equivalents of wealth that a reasonable estimate has placed upon them, by men whose judgments have been unbiassed and unswerved by the overheated infatuation that has too often prevailed here and elsewhere in relation to this subject. The

best proofs of fast returning confidence in these richest of our resources, is found in the large amounts of foreign and home capital that is now seeking opportunity of investment in them, showing most clearly that the denouncements that have been piled upon them were based upon false premises, and are so considered abroad. In addition to this, a local demonstration goes to support this position, and exerts a wide-spread influence, which serves to give weight to the above. It is known that parties who have suffered severe losses by embarking in these operations, still feel confident of success, and still hold those veins, feeling fully assured of their real value, although with their present means they are unable to proceed at the present time with success.

There are but few of these veins that can be purchased from the original holders for any thing like moderate prices, and those that are in second hands are equally firm. No truer barometer of public opinion of their value can be found, than is indicated even under such apparently depressed circumstances. The next metal that will engage our attention is platinum.

Platinum.—This metal appears as widely distributed as gold, and there is scarcely a section of the country, in which gold has been found, but that this metal also has been discovered. This fact would lead us to suppose that from the commercial value of the metal in its crude state, being about one half that of gold, it may at some future day be sought for, as an article of commercial export, among the exhausted placers of the country. It is to be regretted that a more intimate acquaintance with this metal among those engaged in the mining districts, does not exist, as I feel fully confident that the value of our mines would be enhanced nearly 25 per cent. by its collection.

A description of the metal would not lead to its detection, as it is so frequently combined with other metals that closely resemble it, and would be easily overlooked. We shall, therefore, dismiss it by noticing the localities where it has been observed.

It occurs on Salmon River, in the drift that contains the gold in small round grains of a steel gray; also on the South Fork of the Trinity, about eight miles from its junction; on Butte Creek, near Reeves' Bar; on Honcut Creek, embedded in gold, between the North and South Forks, and also in the placers between there and Feather River; on Canon Creek, of Butte co.; on Middle Fork of American River; on Wood's Creek; at Gold Flat, Nevada, with iridium and osmium, and small crystals of rutile at the bottom of the shafts.

This wide dispersion of this metal through the country would indicate that at some future day it may be made a source of profit.

Silver.—This metal has been found in several of the mines that have been opened in this State, all of them, thus far, situated in the southern district. It was first met with in a distinct vein, running parallel with a vein of gold in the southern mine, at Carson Hill. At this place I obtained a fine specimen. I was informed of its being found in the Old Dominion mine, beside the above, and north of it, and also in the Relief mine, south of it. The New-York Mining Company, on the opposite side of the river at Eagle Hill, was the next in which it made its appearance. At the Chilean mine, two miles north of Columbia, it occurs, associated with copper and gold in quartz, in the form of sulphuret; also Frazer's mine, twelve miles east of Sonora, with galena and zinc-blende in the same rock. At these localities it is generally disseminated through the quartz.

At the Washington and Georgia mine, Quartzburg, in Mariposa county, I observed this metal in the form of ruby-blende in the vein-stone containing the gold, and when the metallic gold appeared it was a little lighter in the color than common, evidently from a slight alloy of the two metals.

This metal in other countries has proved an important source of wealth. From its casual occurrence in our mines, and its evident tendency of increase, as you advance south from the Stanislaus, there is just reason to hope that it may in this country become the source of wealth and profit.

Copper.—This metal is much more widely distributed than silver, through the western flank of the range. Commencing on the extreme north, it is found on the North Fork of the Trinity, a short distance from its confluence with the main stream, in a metallic state, in crystals and masses. The vein cuts both sides of the river, but its entire extent is not known. Vitreous copper is found adjoining, and also malachite. It occurs on both the Middle and South forks of Feather River, in the form of carbonate; also between Nevada and Grass Valley, near the Half-way House, and in many parts of the southern mines. I cannot speak with certainty in respect to the ores of this metal in the coast range, having never seen them; but judging from the character of the ores which have been brought from there, I feel warranted in believing that it exists in large quantities, but subsequent explorations must alone determine this point. The varieties of ore which I have seen from these sections, are of that character that would make their reduction easy, if they exist in sufficient quantities to warrant investment.

Chromium.—I would invite your attention particularly to the ores of this metal, inasmuch as from its appearance in large quantities in some sections of the State, and the extensive distribution of the serpentine rocks, to which it is also incident, we

may expect, with a great degree of confidence, that it will be largely developed within our borders. It is an article of great commercial importance throughout the civilized world. Its principal use in the arts is for the coloring of porcelain, dyeing, and as a pigment. The fine chrome yellow so highly prized, is manufactured from this mineral. Nearly all the chrome used in the world, is produced from the mines of the United States; the Shetland Isles producing the next largest amount. The principal locality, and we might say nearly the only one on the Atlantic border from which this mineral is derived, is at the *Bare Hills*, near Baltimore, and this affords the supply of the world.

The greatest amount that can be obtained from all sources at present known, is about 2000 tons, though the market would consume a much larger amount could it be obtained. From the limited supply in the market, the public will, at no distant day, be directed to its development in this State. So soon as cheap and rapid means of communication are obtained with the interior of the State, this ore will probably become an article of export to a large extent, to China, and the Atlantic States, and England. It would be unnecessary to make it an article of export even, unless its reduction would prove too expensive in this State, on account of the high price of labor, for ample material usually exists in its vicinity for this purpose.

The high prices of the various manufactures from this mineral cannot fail to attract attention to its further development; and I feel that the value of the mineral will be sustained, when we say that its market price in the state of rough ore, will equal the product of our best ores of gold in their average, being about $80 per ton. It has maintained this price very uniformly for a number of years.

This mineral is found in veins and masses running through serpentine rocks. These masses are often large, weighing from sixty to eighty pounds, and smaller, and generally disseminated through the rock and upon its surface.

The finest specimens the author has ever seen, have been found in this country, and in some localities in large quantities. A striking feature in the country that abounds in this mineral, among the serpentine formations, is the peculiar barrenness of the immediate district compared to other surrounding sections, and an individual once observing it, would scarcely fail to recognize its characteristics even at a considerable distance.

The principal localities that have been observed as abounding in this mineral, are upon Nelson Creek, near its junction with Feather River, in fragmentary masses. On the ridge, between the North and Middle Forks of the American, in small fragments; on Bear River, four miles above Anson's Ferry · in the

Cayota Diggings, near Nevada; and on Deer Creek, two miles below the city of Nevada.

It is at this last-named locality that its attendant peculiarities may be most conveniently studied. It occurs here in large amorphous masses of twenty to sixty pounds weight, scattered over a low range of hills of some four to six miles in extent. The mineral would be easily mistaken by the passing traveller, for large fragments of some of the darker trap rocks, or dark porphyries.

It is very dense, and possesses a semi-metallic lustre. Rolled fragments are often found of considerable weight on the banks of the creek in the vicinity. My attention was first directed to this mineral by Mr. Henry Pratten, who is at the present time connected with the Geological State Survey of Illinois, and formerly of the Minnesota Survey by the United States.

In what follows, relating to other minerals observed in my tour through the country, I shall confine myself to the principal ores only, and their localities, unassociated with their different varieties, as the limits of this report will not permit of more elaborate detail.

Commencing with the AURIFEROUS GROUP. Among the auriferous rocks we find Talc, at Central Company Mine, Marthenas Creek; Chlorite—Volcano Mine, Middle Fork, American, Talc—Dry Creek, El Dorado county; Chlorite—Angels; Peroxide Iron—Coyote Mountains, Sonora; Heavy Spar—Armagosa Mines, Desert; Arsenical Pyrites—head of Bear River.

SILVER.—Argentiferous Galena, Zinc-Blende, and Arsenic—Frazer's; Sulphuret Silver and Malachite—Columbia.

MISCELLANEOUS.—White, Clouded, Variegated and Jet Marble—Ringgold; White do.—Volcano; Oxide of Iron and Gold—Frazer's; Arsenical Pyrites—Frazer's; Foliated Graphite—Amidor; Marble—Deer Creek; Arsenical Pyrites in Argillite—Eagle Hill; Vitreous and Silicate Copper—Carson's Hill; Carbonate do.—Columbia; Franklinite—Stanislaus River; Jasper—Volcano and Talbot's Hill; Carbonate Copper—Round Tent and Grass Valley; Sienitic Granite—Grass Valley; Augite do.—Anson's, Bear River, and Auburn Creek; Scoria—Sugar Loaf, Nevada; Sienite—Half-way House; Peroxide Iron—Deer Creek; Peroxide Manganese—Deer Creek; Cinnabar—Deer Creek and Yuba River; Petrifactions—Talbot's Hill, Nevada, American River, and West Hill, Nevada; Lignite, Molybdenum, and Fossil Leaves—Nevada; Fossil Lichens—Wade's Creek; Pitch Stone—Sugar Loaf, Nevada, and Double Springs; Mammalian Fossils, *teeth*—Sonora, Douglas's Flat, Murphy's, and Vine Springs; Fossil Shells, Miocene,—Butte Creek and Chico; Magnetic Iron—El Dorado and Placer counties; Obsi-

dian and Peperino—Butte County; Emerald—Vallicita; Rock Salt—near Sonora.

Ossiferous Cavern on Wade's Creek, containing human bones, teeth of the Wild Boar, and other animals. There are other caverns of considerable extent in the calcareous formation of the State, but nothing peculiar was observed in them. Those visited were Martin's Cave, Middle Fork, American River; McKinney's, and Volcano, in Calaveras county.

MINERAL SPRINGS.

There are several mineral springs scattered through the country, consisting mostly of Chalybeate and Sulphur; they are widely dispersed; but a few of them will be noticed;—Chalybeate Springs, upon Destruction, North Feather, Yuba, and English Bar Rivers; Sulphur Spring, at Jackson, Calaveras county.

This last is the most important of all, and to be found in any quantity; it will probably become a place of resort for invalids in the future, as its waters are powerfully medicinal.

[The closing pages of this report, referring chiefly to agricultural indications, are omitted. *Ed. Mining Mag.*]

ART. III.—THE MINES AND MINERAL RESOURCES OF AMERICA.

To W. J. TENNEY, *Editor of the Mining Magazine.*

SIR,—The subject I have selected for your valuable magazine, would seem to indicate great confidence in my own knowledge of the subject, or a vast amount of assurance withal. I am conscious of a great deficiency in both, and it is the necessities of the case alone, which impel me to take the lead in awakening the attention of the people of the United States to the importance of the subject under consideration. Mining and mines are subjects that every child is familiar with in the United States, and it is very generally believed that we have competent geologists, and chemists, and mining engineers.

I am not prepared to endorse the opinions of some, that they themselves are the only competent persons in the world; yet we are in our infancy in every thing appertaining to mines and the mineral resources of our country, as compared with Europe; and particularly so with the people on the continent, where minerals are less abundant, and where they exist in an impure and conglomerate state. Yet, in the opinion of one of the United States Geologists, we are a nation destitute of men, professors, and mining engineers, competent to judge in such matters, as he expressed himself, when his services were sought to make an exploration. He himself declined, on account of previous engagements. He was

requested to name some competent person, and stated that he knew of no one who was competent, but thought Mr. Blake would be, with study and experience. I suggested Professors Silliman, Dana, Avery, Percival, Jackson, or Hays, but he was afraid of hazarding his reputation by recommending any of them.

An impression has taken deep root in the minds of the American people, that to secure success in a mining enterprise, it is essential that a Cornish miner be hired to take charge of the mine, and all the rules and traditions be observed, connected with Cornwall and Cornish mines, thereby securing to the miner as much pay and as little labor as possible, and to the proprietors, or stockholders the smallest possible results; instead of employing Americans, or Irish laborers, and instructing them in the art of mining, or even adopting the more feasible plan of importing emigrants from the Hartz or Ural mountains,—men who are happy in the receipt of three dollars per week for their labor, and who were born and educated in the mines,—men temperate and industrious from necessity, and as intelligent as the safety of the sovereign, the king, and his kingdom will permit them to be. It is a mistaken idea that the subject of a king can be as intelligent, as active, and as useful, as a man who is educated to feel that upon his judgment, his character and efforts, the permanency of the institutions of his country depends; who feels and sees in himself the sovereign, and is governed in all his actions by the responsibility he holds, and the influence he exercises.

But I find myself digressing from the subject of "The Mines and Mineral Resources of America." I had proposed, in beginning this article, to confine myself to the results of my own personal observation, but from want of time, I shall depart from my original plan, and pass respectively from one State to another, commencing with the northeastern, and, in order, glancing at their resources and mineral wealth.

MAINE.

As early as 1834, I visited the State of Maine on business connected with its mineral resources. The State abounds in iron, lead, zinc, antimony, copper, molybdena, graphite, manganese, titanium, and bismuth, in great abundance and variety; also in precious stones, consisting of jasper, beryl, garnet, amethyst, emerald, chalcedony, ruby (amethyst). It also abounds in the finest granite, remarkable for the purity of its quality, and in boulders upon the surface, large enough for statuary purposes; some are from forty to fifty or sixty feet in height, and without a seam or an imperfection. There is an abundance of marble, some of which is of a good quality, also slate and limestone. In

some places anthracite coal, in small quantities, has been discovered; also phosphate of lime, fullers' earth, ochres, and clays in great abundance and purity.

NEW HAMPSHIRE.

In this State is found iron ore in a great variety of forms. Ores exist in large quantities, similar in character to those in Maine, such as copper, native silver, lead, tin, arsenical cobalt, graphite, manganese, and antimony. Several of the mines have been worked to a considerable extent, and at a profit. Among the former are the Franconia Iron Mines, and Shelburne Lead Mines. Efforts are now making to prosecute these operations with vigor. In addition to the above mines are found alum, kaolin, talc, graphite, granite, native sulphur, fullers' earth, steatite; also the following precious stones,—garnet, jasper, amethyst, and beryl. This State abounds in phosphate, and fœtid carbonate of lime; granite, marble, and slate; emery is found in several localities, together with a variety of mineral paints, usually occurring in mineral districts. When the mineral resources of this State are fully developed, no doubt exists of their producing satisfactory results.

VERMONT.

This State abounds in iron, copper, manganese, titanium, plumbago, lead, and zinc, &c. In fact, all, or nearly all the minerals are found in this State, that exist in Maine and New Hampshire, with the addition of gold, which is met with in various locations along the Green Mountain range. The mountains abound in fine marbles. In some quarries, when worked to a sufficient depth, no doubt can be entertained but statuary marble of the finest kind, will be obtained in great perfection. There is also found, in great abundance and purity, talc, serpentine, verd-antique, fluate of lime, carbonate of lime, magnesian limestone, fœtid carbonate of lime, ferruginous carbonate of lime, graphic slate, clay slate, flint, hornblende slate, roofing slate, mountain leather, and marl. The precious stones are serpentine, jasper, garnet, amethyst, chalcedony. The State produces a superior block marble, which has been extensively used, and compares favorably with the imported article; lignite, also, has been found in quantity in the iron mines at Brandon, and is used as a fuel in generating steam.

MASSACHUSETTS.

This State, like most of the New England States, abounds in minerals, and like her sister States, is celebrated for iron mines, that have been extensively worked, producing nearly all the iron consumed in the country, at the close of the Revolution. This iron is remarkable for its strength and purity. The mines are worked at the present day. Perhaps next in importance, are the

great lead mines of North, South, and East Hampton. These were worked extensively previous to the revolutionary war, and afterwards abandoned; they were recently purchased by Prof. Charles Stearns, and under his management have been thoroughly explored, and promise to become mines of great magnitude, equal in extent to any in America. Subsequently, Mr. Stearns sold his interest, and these mines have now passed into the hands of the Hampshire Consolidated Mining Company.

The ores in the New England States, and also marble, verd-antique, slate, granite, &c., are found in liberal quantities.

RHODE ISLAND.

Iron occurs in large quantities in several places in this State. Lead, silver, and copper mines have been worked with indifferent success, at intervals during the last century. Graphite is to befound in many places, also the oxide of manganese, and magnetic iron sand in considerable quantity; yellow ochre, and red oxides of iron occur in a great variety of forms, many of which may be used with advantage.

The precious stones of the State consist of garnets, cornelian, topaz, agate, amethyst, chalcedony, amianthus, and jasper. Peat and marl abound. Thus far anthracrite coal has proved to be by far the most abundant and productive mineral, and several mines are now worked, yielding annually several thousand tons of good coal.

CONNECTICUT.

This State is probably one of the richest in point of mineral wealth. Her iron mines produce annually large quantities of the purest and best quality of iron. The "spathic," or carbonate of iron mines at Roxbury, are amongst the most valuable in the world. They are identical with the Hartz Mountain mines, from which the celebrated Norican iron was originally manufactured, and the present German or Hessencler steel is produced. They differ from the Hartz only in the abundance of the ore, which is accompanied with a lode of highly argentiferous galena, producing 50lbs. silver to the ton of ore, and 77 per cent. of lead. These mines were recently the property of Messrs. Stearns & Sturges, but have been purchased of them by the Connecticut Silver-steel Company, who are making preparations to manufacture steel. From the purity of the ore, and its adaptation for that purpose, they promise results heretofore unknown to steel manufacture.

Next in importance to this is the Bristol Copper Mine. There are also other mines of interest, such as the Lanes Mines, Monroe Mines, and the Middletown Lead Mine. The Lanes mines are remarkable for the great variety of minerals found at that location. The various kinds discovered are thirty-two in number, but the real character of the vein has not been determined.

Sulphuret of silver, sulphate of barytes, sulphate of zinc, sulphuret of lead, native copper, red oxide of copper, arsenical nickel, arsenical cobalt, pyritous and carbonate of copper, molybdend, sulphuret of antimony, white copper ore, antimonial gray copper, native antimony, sulphate of antimony, native silver, native bismuth, blende, native tellurium, yellow oxide of tungsten, calcareous oxide of tungsten, ferruginous oxide of tungsten, red oxide of titanium, alum, native sulphur, carbonate of iron, chromate of iron, oxide of manganese, are amongst the most remarkable of the mineral products of Connecticut. There are also many valuable quarries of marble, verd-antique, and granite, besides a great variety of precious stones, which are as follows: amethyst, agate, jet, garnets, beryl, chalcedony, emerald, opal, precious serpentine and jasper. In all of the New England States there exist evidences of mines of rare richness.

[To be continued.]

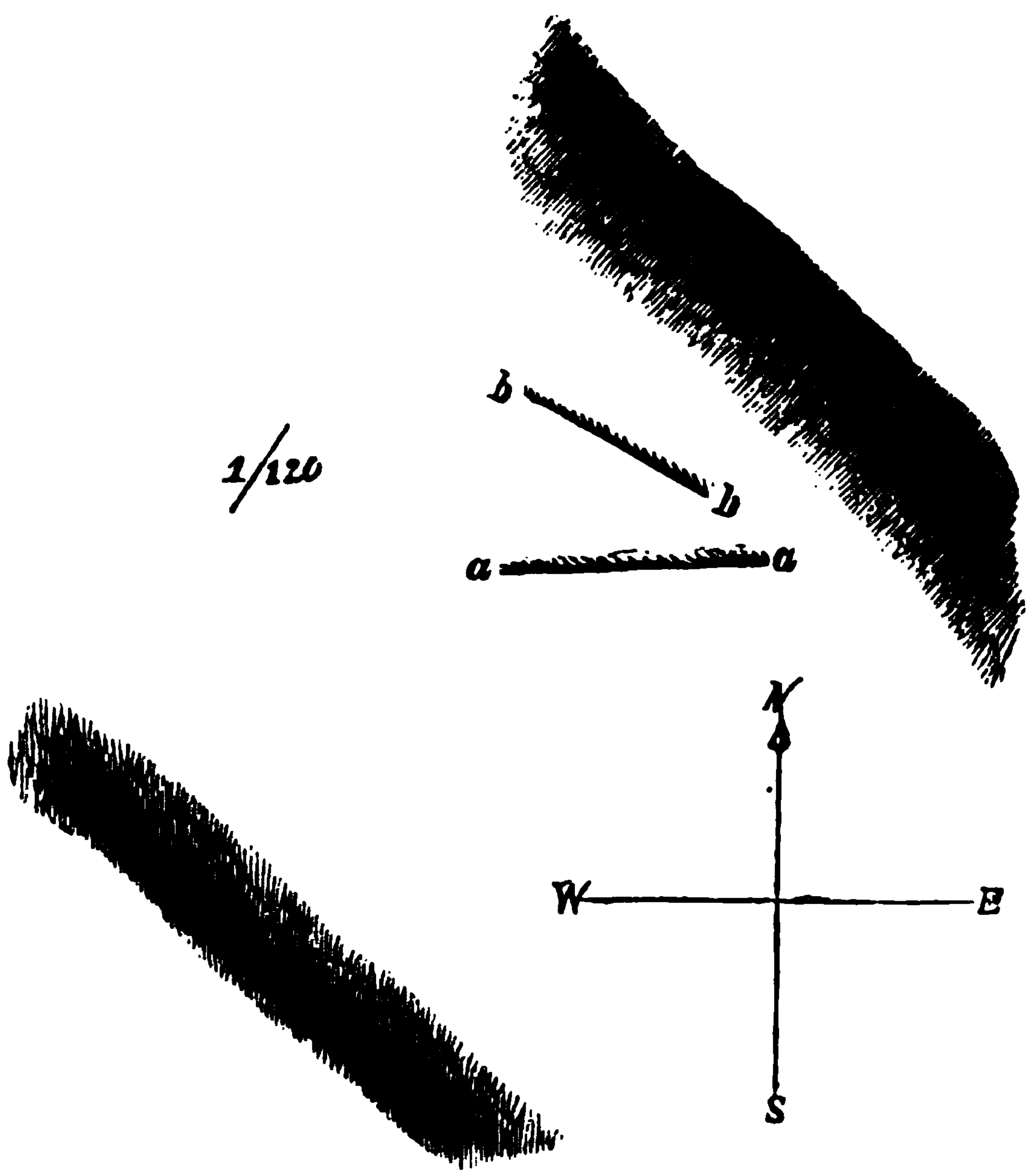
ART. IV.—REPORT ON THE MINING PROPERTIES OF THE SHELBURNE LEAD MINING COMPANY, AT SHELBURNE, NEW-HAMPSHIRE. BY PROF. JAMES T. HODGE, OF NEW-YORK.

THE SHELBURNE LEAD MINE is situate about a mile and a half north of the Androscoggin River, in the town of Shelburne, New-Hampshire, within four miles of the eastern line of the State. It is most easily reached by the way of Portland, and thence by the main route towards Montreal, up the valley of the Androscoggin. This is the route of the railroad now in progress, which, it is expected, will be completed in about a year, between Portland and Norway, a distance of forty miles, and soon after to be connected with the northern portion of the road, now in progress of construction in Canada; the road, passing up the valley, will run within a mile and a half, or less, of the mine, at a distance of seventy-five miles from Portland. Until it is in operation, the route for transportation is by teams, to the head of the Portland canal at Harrison, and thence sixty-seven miles to Portland. The expense of the land carriage being about $3, and of the canal about $1 per ton. The land carriage is low, because of the little transportation from the interior, the teams generally going back to the coast empty.

The road along the valley is very good, and on the whole route from Portland to the mine, there are no bad hills. The country is settled by a very enterprising population, and is far more flourishing in fertile farms, and rich orchards, than one would expect with so cold a climate.

This section of country is entirely composed of granitic rock

formation. Mount Washington, sixteen miles S. W. from the mine, is the most elevated peak, and around it, in every direction, are scattered groups of minor hills, with the ragged features peculiar to these geological formations. Here and there, in the different towns, are found metallic veins of different ores, —as the enormous iron ore beds of Jackson and Bartlett—the tin ore veins of the same vicinity—the copper ores of Warren—the argentiferous lead ores of Eaton, and those of Parsonfield and Shelburne. Art has done little hitherto to develope these resources, but the evidences are favorable that this country will become an important metalliferous district.



It is of consequence to take this general view of the character of the rock formations, for the reason, that it is unusual to find workable veins of ores in a district where they are not of frequent occurrence. And though it may be said of all those I have named (excepting the iron ores), that their importance is by no means established, this may be explained by the little attention that has been directed to them; no systematic attempt ever having been made to prove the mines, before the commencement of the mining operations at Shelburne. From the nature of the veins (perfectly similar in this respect to some of the most valuable veins of the European mines) large outlays are required to open them at the depths where the ores are usually found in great abundance and richness; and with the little mining expe-

rience yet acquired in this country, it is not strange that capitalists have been slow to engage in such adventures.

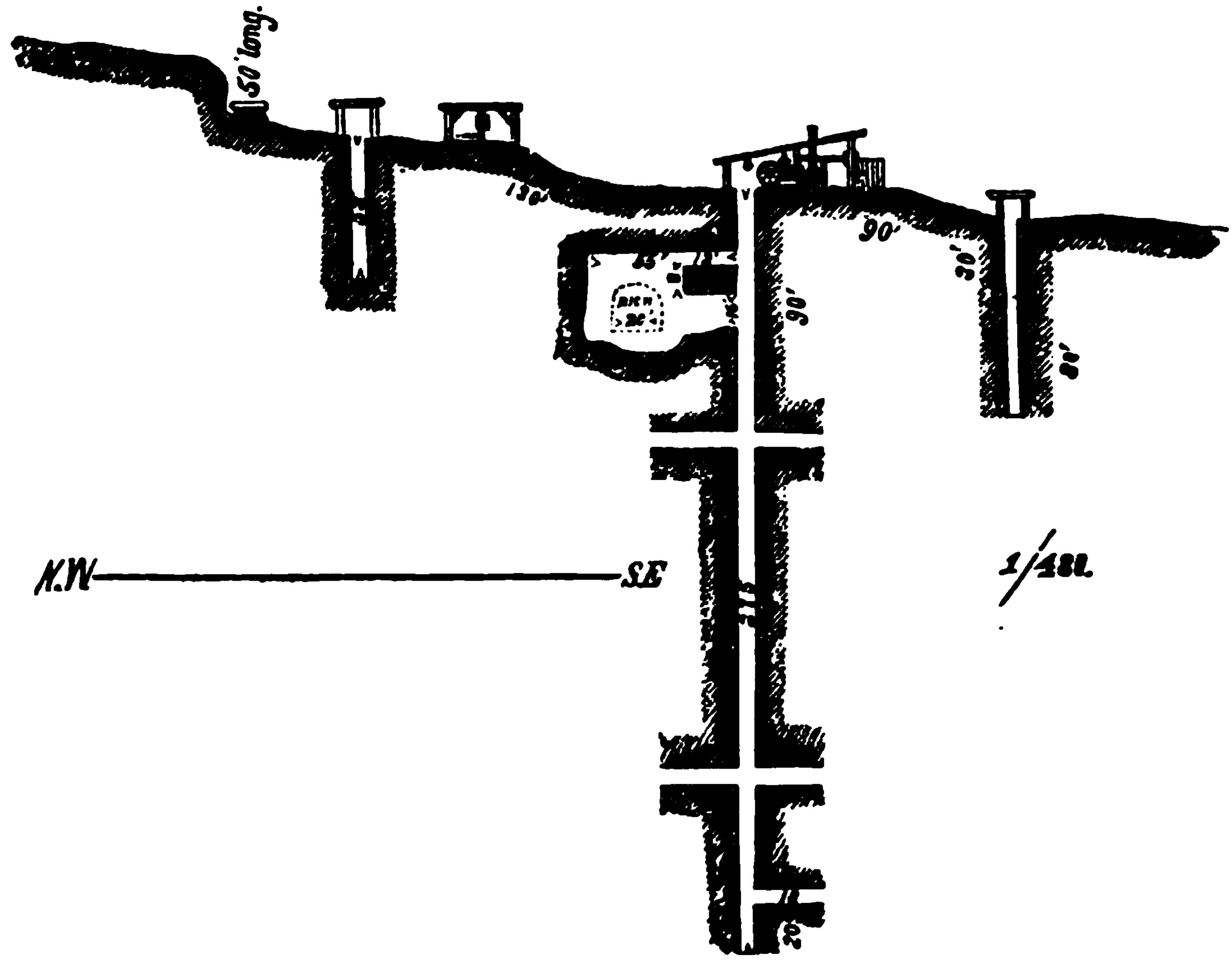
Through a break between the hills, the road turns off from the valley of the Androscoggin, and for a mile and a little over, follows up the course of a small branch called Lead River, to the mine. Here sufficient space has been cleared for the erection of a few houses, and on the stream a very good mill, with suitable machinery for crushing and washing the ore, has been built, and under the same roof is a good Scotch lead furnace, with blowing apparatus, &c., in complete order.

An excellent position for these works was found within a few rods of the point where the vein crosses the stream; and a dam of a few yards in length, was sufficient to give a fall of eighteen feet. A breast-wheel was put up below this, of sixteen feet diameter, which, with the usual supply of water, will be able to drive the works all the year, except, perhaps, in some eight weeks in the driest part of the summer. Above the dam, the vein was exposed to view in a deep ravine, the bed of a little brook, on the western side. This ravine appears to have been produced wholly by the crumbling away of the vein stone, which is more easily decomposed by atmospheric agencies, than the harder micacious rocks on the sides. On the eastern side, the position of the vein appears to be marked by a depression in the surface; but no water-course has there served to enlarge or deepen it, as on the western side. In this ravine it is plainly exposed; a perfectly well defined, true vein, made up of small veins, composed principally of quartz. These, united in one, of the extraordinary size of twelve to twenty-five feet in width, pursue a general east and west course across the brook, and through the mountains, on each side; it is traced over the surface where the rock is exposed, and is met within the next valley to the west, at a distance of about two miles from the mine now wrought. This is the account given me by the agents at the mine, and specimens of similar ore to that found at Lead River, they showed me, which they said came from the vein in the other valley. From the character of the vein, as I saw it, no doubt can be entertained that it does thus go through the mountain, and its size is so remarkable, that it is highly probable it continues a considerable distance farther.

The position of the vein is nearly vertical, its inclination being 71° to the north.* At the surface it appears to consist almost wholly of quartz, but by close inspection a small seam of

* The Professor is here speaking of the principal vein, which he had explored. The sketch on the preceding page has been more recently prepared by an experienced geologist, to represent the direction of the different veins, of which the lode is composed.

metallic ore is discovered near the northern or upper side of the vein. In some places this is an inch or two wide, and then narrows away to a small fraction of an inch; never, however, completely lost. The ores at the surface were found to be the sulphurets of lead, zinc, copper, iron, and the first named, the prevailing ore, proving to be highly argentiferous, containing, according to Dr. Jackson's analysis published in his State reports, three pounds of silver to the ton of ore. It seemed to be an object to pursue the vein to some depth; for if it should be found to increase in quantity, as is usual with similar veins in other countries, such ore would well repay the expense of extraction. For nearly two years the mining operations and surface work necessarily connected with them, which in a wild spot like this usually exceeds for some time the underground work, have been vigorously prosecuted. Three shafts have been sunk in the vein, as represented by recent explorations, thus:—



In all of them the metalliferous vein pursued its course without interruption, though subject to great irregularities of size and productiveness. This is always to be expected with veins of this character, and while no accurate estimates can be made of the quantity of ore likely to be met with, the general principles recognized in mining can be applied to establish some idea of the importance of this vein. One of these is that it is *permanent*,—can never be exhausted in depth, nor probably in length. Another, that though small at the surface, it must

increase with the depth: but this is to take place by no steady and regular enlargement of the lode, but by increased number and size of the pods of ore, or swellings of the metalliferous veins; that these are not to be looked for near the surface, and except to work out the pods that may be met with in descending, little exploration away from the main shaft ought to be made within less than two or three hundred feet of the surface.

The workings yet made have resulted in the discovery of one of these pods of rich ore, as marked in the above section of the mine, commencing at the depth of about 35 feet, and gradually enlarging both in thickness and length in descending. At about 60 feet down, this pod is some 20 inches thick, including several layers of quartz within the seams of pure ore. The proportions of gangue and ore vary so much, that no exact estimate can be made of the actual amount of pure galena at this spot. A part of the vein shows five inches pure ore, and by the side of it are other smaller streaks, making up, with more or less quartz and calcareous spar, the 20 inches above named. Every new blast changes the proportion of ore and veinstone. The length in the vein of this pod was, when examined, from 25 to 30 feet, and two sets of hands, two in a set, were constantly employed in taking up the floor of the level or drift. They went over this length, say 30 feet, in eight days, taking up also about two feet in depth; supposing that this contained but three inches in width of pure argentiferous galena, the cubical contents of $30 \times 2 \times 0 \times 25 = 15$ cubic feet, and a cubic foot of this ore weighing 450 lbs. the amount extracted would be 6750 lbs. This when crushed and washed is worth over two cents per lb. as lead ore, and about $1.25 per oz. for the silver it contains. The occurrence of this pod so near the surface is highly encouraging, for the existence of others of much greater value at the depth at which such veins are usually wrought. And as in a matter of this kind, where nothing certain can be predicated, we must rest very much upon the opinions of those familiar with similar mines elsewhere, I shall refer here to the opinions of a gentleman, who resided many years in Chihuahua, Mexico, and who has been extensively engaged in mining operations in that region; and who seeing, at the fair in Boston, some specimens of this ore, was so pleased with their appearance, that he visited the mine, and afterwards purchased an interest in it, though about to return to Mexico. This gentleman was originally from Salem, Mass., and his name is Meserve. He informs me that many of the mines of Chihuahua, which are among the richest in Mexico, give not so good promise of silver near the surface as this mine, and much ore that is wrought yields a less percentage of silver to the ton of lead, than does that of the Shelburne mine,—that such a show

of ore would there be considered as fully warranting the establishment of large mining operations, and the laying out of shafts of several hundred feet in depth. The next point is the quality of the ore. Though the veins contain a variety of ores mixed together, sulphurets of lead, zinc, copper, and iron, and, according to Dr. Jackson, of cadmium also, the prevailing kind which gives its name to the mine, is lead ore containing silver. This argentiferous galena occurs sometimes mixed with the other ores, requiring thorough crushing and washing to separate it from them, and sometimes, particularly in the large pods and thickest portions of the veins, it is almost free from such mixture. A sample of the clean ore, which I took from the washing and assayed in the "*dry way*" (which method always yields a less percentage of lead than is obtained by analysis in the "*wet way*"), yielded 73.75 per cent. of lead, containing silver, which amounted, on separation, to the $\frac{1}{476}$ part oz. of silver to the ton of 2,240 lbs. of argentiferous lead,—4.7 lbs. avoirdupois of silver; to the ton of clean ore 3,472 lbs. avoirdupois, equivalent to 4.22 lbs. troy weight. When lead at Galena, Illinois, is worth three cents per lb., clean ore sells for $15 per thousand lbs. or $33.70 per ton. One third may safely be added to this for smelters' profits and higher value of lead,—and the worth of a ton of ore for lead only is say $45.00. The 4.22 lbs. troy of silver is worth, at the price paid at the mint $1.29 per oz., $65.33; deducting from this the cost of separating—estimated at $6.00 per ton of lead, or $4.50, the whole value of the ore is $105.83 per ton. The following is a copy of a letter from England, in reply to one sent with a sample of the ore for examination.

CHESTER, 29th January, 1849.

Messrs. CHAPMAN, BOWMAN & Co., *Liverpool:*

GENTS.—We have tried the cask of ore referred to in your letter of the 12th inst. and there called "fibrous lead ore." The cask contained 7 cwt. and in its unwashed state, as taken from the cask, is worth 15*s.* per cwt.; there were lumps of solid ore to be picked out, which if the whole was equal to, the value would be raised to £32 per ton. One lump in particular was very rich, and contained 81. of lead, with 84 oz. of silver to the ton of lead. For lead and silver together, it is one of the best samples we ever tried; but at least one-third of what was in the cask was nothing but dirt, which ought to be washed out. This will be presented to you by our Mr. Frank Walker, who will pay you all the expenses on the ore. We are, Gents,

Very Respectfully, your Obedient Servants,

Signed, JOSEPH WALKER, PARKER & Co.

The same house afterwards received a lot of some six tons of the ore, which does not appear to have been well dressed, as they had some difficulty in reducing it. Their returns of this lot are as follows:

Account sales 48 kegs lead ore received pr. "Fanueil Hall," from Boston, for ac. Shelburne Mining Company, 1847.

Oct. 5, B. T. Walker, Parker & Co.

	Tons.	cwt.	qrs.			
For 16 kegs	1	3	2	£.17 per ton	£28 9*s.* 6*d.*	
" 32 "	4	0	0	£.16 "	64 0 0	
					£92 9 6	
				Charges	12 4 7	
				Net Proceeds	£80 4 11	

Examples of the ore have been assayed by A. A. Hayes, Esq., State Assayer of Mass., and his results I give.

Results on two samples lead ore, from Shelburne Mining Co. First assay, 55 silver lead; second average of 2.564 of silver lead, silver lead gave 3.2 lbs. of silver per ton.

Second sample, first assay, 39 silver lead; analysis 43, the ore very refractory; silver lead gave 3.6 lbs. per ton silver; other samples in boxes 3 and 4. 300 lbs. of this ore assayed was 44.6. Silver lead gave 6.447 lbs. per ton of silver. Boxes 1 and 2, 280 lbs. ore, assay 42.6 silver lead; one ton of latter contained 7.53 lbs pure silver.

Dr. C. T. Jackson, in his report to the Legislature of New Hampshire, speaking of this ore, remarks that "it contains 3 lbs of silver to the ton. Hence the ore is worth from $40 to $60 per ton for the silver, while it also yields 70 per cent. of lead in the large way, and is worth, at 3c. per lb., $42 per ton."—p. 228.

These results agree in fixing a high value to the clean ore. The difference between the assay of the second sample of Mr. Hayes, and the analysis of the same with his remarks of its being a refractory ore, shows the importance of a thorough separation of the ores by washing before smelting. With such preparation, Mr. Hayes appears to be of opinion that no serious difficulty will be encountered in the smelting, even should a loss of lead occur in the furnace; all the silver goes with the ore that is reduced.

Silver is profitably extracted in England from lead that contains only 3 oz. to the ton. In Cornwall and Devonshire there are rich mines of argentiferous galena, some of which were wrought and the silver separated as far back as the year 1293. They yielded 40, 50, 60 and 100 ounces of silver to the ton of lead; one mine near Bear Alston, in Devonshire, has yielded ore as rich as 140 oz. to the ton of lead; this is the highest of any yield of argentiferous galena.

The Shelburne mine is well situated in respect of facility of working; but little water flows into the mine, and even if the shaft should be carried to the depth of 300 feet, I think it can be kept dry with one horse working the whins. A cast-iron pump would be preferable to the present mode of raising the water, though this answers tolerably well, and is no serious expense.

The high land above the mine is covered with a fine growth of hard wood timber, the value of which has greatly increased since the laying out of the railroad. The possession of so much will insure abundant supplies of the best of charcoal for smelting at the lowest rates. This, which in Illinois and Wisconsin is a costly item to the smelter, being worth $12\frac{1}{2}$c. a bushel, can be delivered to the company's furnace at 3 cents. Another advantage in holding so much territory, some 15,000 acres, is in the control of the vein over several miles in length ; so that it may be opened at different points, and if found advisable be divided among different companies. The chance is also good of finding other veins* on the property. Very respectfully, I am yours,

No. 1 *New-street,* NEW-YORK. JAMES T. HODGE.

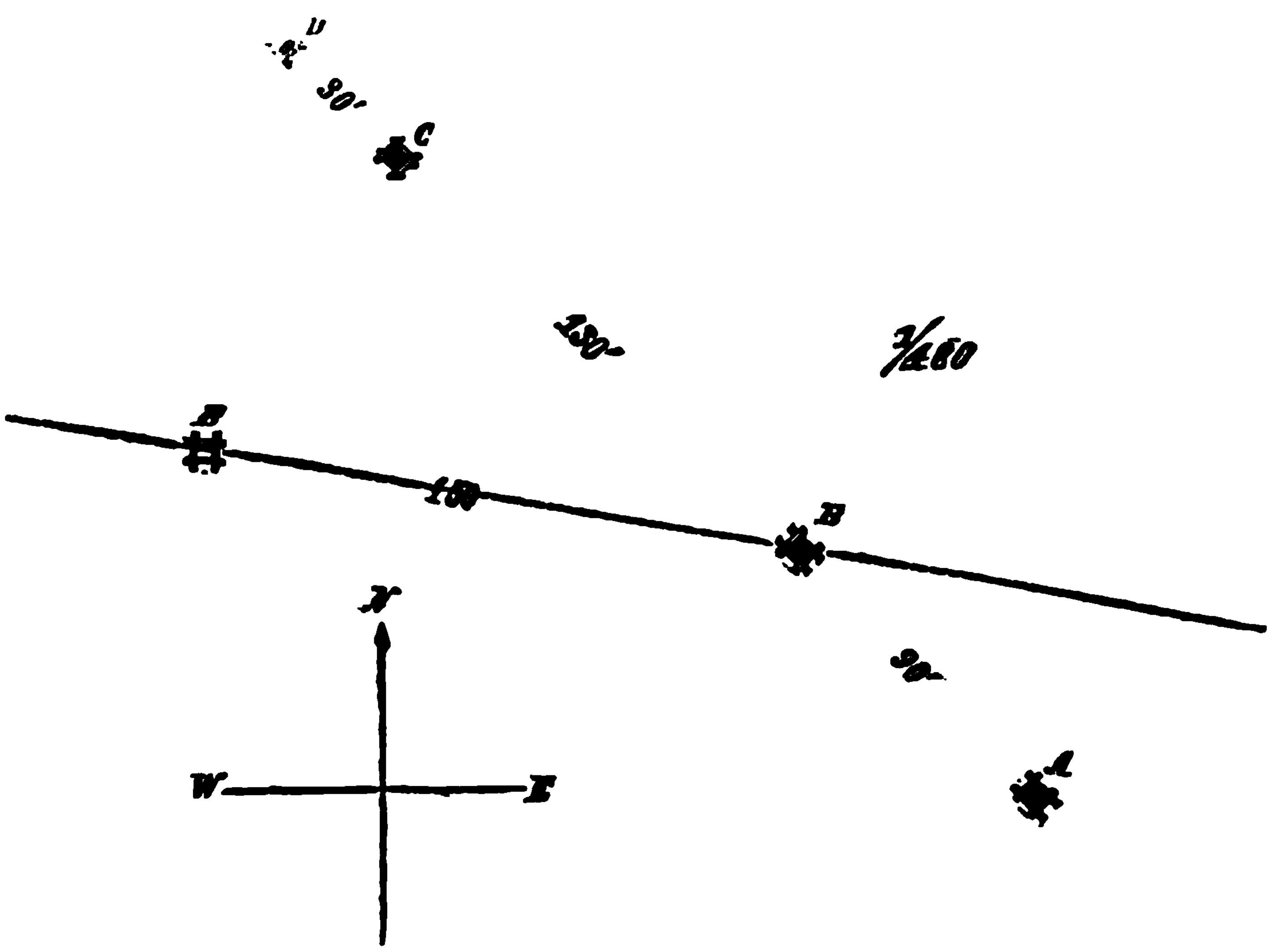
Mr. A. Colby's assay of pig lead.

In 4 oz. $7\frac{1}{8}$ grs. Silver.
In 2,000 lbs. 101 oz. $17\frac{1}{2}$ dwts. at 1.29c. $131.37.

Mr. A. Colby's assay of lead ore.

Produce from lead $75\frac{3}{4}$ parts.
In 4 oz. pig lead, silver $7\frac{1}{2}$ grs.
In 2,000 lbs. 125 oz. fine silver, at $1.29 per oz. $161.25.

NEW-YORK, *Oct.* 23, 1847 JOHN WATERS.



* For the sake of showing more fully the true course of the principal vein which has been discovered, with reference to experimental explorations and shafts which have been sunk, the above sketch by Dr. Partz is subjoined.

ART. V.—CUMBERLAND COAL.

THE last Report of the Cumberland Coal & Iron Company, is very full in the details of the coal business of Alleghany County, in Maryland. We have gathered from it such particulars as might be interesting to the readers of the *Mining Magazine*, who are unacquainted with that region of the country.

The coal is named Cumberland, from the principal town in the neighborhood of the great bed. This town was, during the Indian and French wars, one of the western outposts of the British and Colonial army, under the command of Colonel, afterwards General Washington.

The region in which this valuable mineral is found, is cut longitudinally by George's Creek at the South, Jennings' Run at the North, and Braddock's Run at the East; the beds of the streams being considerably below the base of the lower stratum of the coal. On either side, and above the water, the great bódy of the coal is deposited, and can be worked with great advantage without sinking a shaft, except for the purposes of ventilation. It lies somewhat in the shape of a canoe, with a transverse section cut from the centre by the action of the water in the above streams, on either side of which the various strata rise with the ascent of the hills, their out-croppings being near the summits. The openings are commenced near the base, and as the entrance is effected, the water collecting in the different galleries or rooms flows out voluntarily, thus superseding the necessity and expense of steam pumps.

In 1836, systematic researches were made, under the direction of the George's Creek Coal & Iron Company, to expose a complete section of the Frostburg basin. In the report of this operation, it is stated that it developed in a height of four hundred and fifty feet, eighteen beds of coal, the largest of which was fourteen feet thick, while the total thickness of all combined was not less than fifty-two feet. In this space there was also said to be seventeen feet of iron ore. Dr. Ducatel, at that time Geologist for the State of Maryland, estimated the whole coal field to be one hundred and seventy-six miles square, or nearly 113,097 acres, from which he subtracted 26,250 acres for denudation by streams and water-courses, leaving 86,847 acres as area, underlaid by beds of coal and iron ore.

Many of these strata are only two feet in thickness, and may not be economically mined; it was therefore concluded at that time, not to estimate the workable seams at more than forty-five feet, or fifteen yards. Assuming this as a correct quantity, the calculations to ascertain the whole number of cubic yards in the

coal field, give the following results:—extent in acres, 86,847; number of square yards per acre, 4,840; thickness of beds, 15 yards. The product of these numbers gives the whole number of cubic yards, 6,305,137,287; and estimating one ton of coal as occupying the space of a cubic yard, the amount in the basin reached no less than 6,305,137,287 tons of coal.

Of the iron ore, nine feet, or three yards, was calculated to be workable, and with the same elements of calculation as for coal, the amount of ore was estimated at 3,237,576,144 tons; sufficient to yield, in the proportion given by the test of practice, 1,079,191,714 tons of crude iron.

The Report of the Cumberland Company gives a different amount. It states "that recent and critical explorations render it more than doubtful, whether the entire Cumberland coal basin contains more than 18,000 acres of land, underlaid by the 'great vein' of available and marketable coal."

The extent of the estate of this Company is thus described by the Directors:—

"The landed estate of the Cumberland Coal and Iron Company, embraces consecutive and adjoining tracts, beginning at a point about seven miles distant from Cumberland, on the National Road, and extending in width, almost across the coal basin, a distance of four miles. From the town of Frostburg, in a southerly direction, its extent is about eight miles. It contains 10,045 acres of land, every acre of which is underlaid with the smaller seams of coal; but, what imparts to the lands of this Company their great and peculiar value, is the fact, that, in addition to all the small veins, 7000 acres or more contain the great, or fifteen-feet seam, as well as several smaller seams lying above it, which, of course, are not to be found in lands that are not underlaid by the great vein.

"Starting in the valley of George's Creek, at the point where the southern outcrop of the great vein is first met with (on the way south from Frostburg to Lonaconing), about six miles from Frostburg, and following it to the Potomac at Westernport, although the line of the coal is an almost perfectly horizontal one, yet it will be found, at and above Westernport, that the stratum rapidly approaches the summit or apex of the mountain, until the superincumbent earth, or "covering," as the miners aptly term it, dwindles to a comparatively few feet. The coal found in this condition, when exposed to the atmosphere, disintegrates, or slacks, and after a few handlings, becomes an almost impalpable powder, unfit for use, and of course wholly unsalable.

"It will be observed, from the foregoing statement of facts, that considerably more than three-eighths of the entire lands of the region, which are underlaid with the great vein, are com-

prised in the possessions of this Company. Considerable bodies of land, underlaid by the great vein, are still owned by individuals. The aggregate incorporated capital of organized, so-called coal and coal transporting companies in the region, exclusive of the Cumberland Coal and Iron Company, exceeds $18,000,000. In this, of course, the Baltimore and Ohio Railroad, and Chesapeake and Ohio Canal Companies, are not included."

In the southern part of this region, the estate of the Phœnix Mining and Manufacturing Company is located. The recent report of this Company thus describes their property:—

"The Company own twenty-two thousand acres of mineral lands, situate in the George's Creek Valley, in the County of Alleghany, in the State of Maryland, and in the Counties of Hardy and Hampshire, in the State of Virginia, ranging along both sides of the North Branch of the Potomac River, in the very heart of the Cumberland Coal field, abounding in the best quality of semi-bituminous coal, iron ore, and other minerals.

"On the Company's Mineral lands are found, in great abundance, veins of the very best semi-bituminous coal, some of which measure over fifteen feet in thickness, underlaid with iron ore of the richest quality. Those treasures, so easily approached, are a sure guarantee that at no distant day the shores of the Potomac will become lined with iron foundries and other establishments, requiring a large amount of fuel, and, therefore, necessarily creating a large consumption of coal from the immediate vicinity of our mines."

MEANS OF TRANSPORTATION.

Where there is such an abundance of coal as in the Cumberland district, and so easily obtained, the facilities of transportation to market become a prime object of consideration. The Baltimore and Ohio Railroad, and Chesapeake and Ohio Canal are the two great arteries of trade: one, the Baltimore and Ohio Railroad, 179 miles in extent, from Baltimore to the town of Cumberland; and the other, the Chesapeake and Ohio Canal, 184 miles in extent from Washington to Cumberland. Both these works are most substantially constructed. The former was commenced, and the corner stone laid, on the 4th of July, 1828, and has cost, in its construction to Cumberland, $10,096,571. It was completed and opened to Cumberland on the 5th of November, 1842. The latter was begun during the administration of John Quincy Adams, as President of the United States, who dug the first spadeful of earth on the 4th of July, 1828, but was not completed and opened to Cumberland until the 10th day of October, 1850. It cost upwards of $15,000,000, and was originally

intended to connect the waters of the Chesapeake Bay and Ohio River. This design was long since abandoned, its friends being content to reach the mineral riches of the Cumberland region. Both these works are connected with the Cumberland coal-field,—distant, at its northern end, about nine miles from the town of Cumberland,—by two lateral locomotive railways: one eleven miles in extent, owned by the Cumberland Coal and Iron Company; and the other fourteen miles in extent, owned by the Mount Savage Iron Company. These are the only railroads in the Cumberland region entirely constructed. The George's Creek Coal and Iron Company are now engaged in making a railroad of ten miles in extent, from a point above Lonaconing, to connect with the Baltimore and Ohio Railroad, at Westernport, twenty-eight miles west of Cumberland. It is presumed that this work will be finished shortly, if not already completed.

RATES OF TRANSPORTATION.

The Report of the Cumberland Company thus describes their arrangements for transportation:—

"The negotiations opened with the Baltimore and Ohio Railroad Company, with a view to securing the stability of the present charge for transportation, resulted in a contract between that company and this, which is to continue for five years. By its terms, but $1.75 per ton are to be paid for the transportation of coal from Cumberland to tide-water at Baltimore, and, *in addition* to a fair and just proportion of the coal transporting power of the railroad company now owned, or hereafter provided by their own means, the company are to have the exclusive use of 180 ten ton iron hopper cars, equivalent to 60 cars per day. The latter, with the requisite locomotive power, are now in process of construction, and all will be ready for use on or before the first day of April. They are to be paid for by funds loaned to the Baltimore and Ohio Railroad Company, by this company, for the term of five years, at the rate of six per cent. per annum. $150,000 of the loan have already been advanced to the Baltimore and Ohio Railroad Company, and the remainder will be paid whenever called for. The whole loan, it is believed, will not exceed $180,000.

"Prior to the entertainment of our proposal for the last reduction, to wit, from $2 to $1.75 per ton, by the Baltimore and Ohio Railroad Company, and subsequently, at the time it was made, it was very distinctly announced by the president of that company, that the reduction could be conceded on one condition only; to wit, that they should have proper guarantees and security, that the entire coal transporting power of that company should have steady and constant employment. These being fur-

nished by the Cumberland Coal and Iron Company, in their offer to employ all the coal power of the road, not allotted to other parties on like conditions, the reduction was accomplished.

"In consideration of the high rates of freight charged on coal shipped coastwise from the port of Baltimore, and the scarcity of vessels at even the highest rates, the company also covenanted, in their contract with the Baltimore and Ohio Railroad Company, to invest at least $100,000 in barges, to convey their coal from Baltimore through the Chesapeake and Delaware, and Delaware and Raritan Canals, as well as merchandise to Baltimore, from New-York and other northern and eastern points, destined for the Ohio river, or intermediate points west of Baltimore. Merchandise carried to Baltimore by these barges, the Baltimore and Ohio Railroad Company have agreed, in turn, to transport to the Ohio River, or intermediate points, on at least as favorable terms as that coming through other channels or other transporting companies. This arrangement enables the Cumberland Coal and Iron Company to contract at New-York, or elsewhere, for '*through* transportation' of merchandise to the valley of the Ohio, and by means of its profits to diminish the cost in the shipment of their coal.

"The results of our negotiations for the reduction of tolls, opened with the Chesapeake and Ohio, Chesapeake and Delaware, Delaware and Raritan Canal Companies, although not so favorable as has been hoped,* are, notwithstanding, such as justify large investments for increasing our mining operations and transporting power.

"The Delaware and Raritan, and the Chesapeake and Delaware Canal Companies have reduced their tolls on Cumberland coal. The reductions were made in consideration of the large expenditures incurred by the Cumberland Coal and Iron Company, in providing barges and propelling power for the exclusive navigation of those works.

The Chesapeake and Ohio Canal Company have also reduced their tolls on coal, from Cumberland to Washington, from 46 cents to 36 cents per ton, so soon as 100 additional coal carrying boats are placed on that work. Preparations were immediately made to comply with this condition, and the engineer and superintendent in chief of this company, was ordered to have the required number of canal-boats constructed, if possible, in time for the coming spring trade.

"Though these reductions in tolls by the several canal companies, as well as the last reduction in the charge for transportation, by the Baltimore and Ohio Railroad Company, have been

* Allusion is here more particularly had to the Chesapeake and Delaware Canal.

the fruits, exclusively, of the labors, contracts, and investments, of the Cumberland Coal and Iron Company, we have not sought any advantages over neighboring coal companies of the region, but have left them to enjoy the benefits equally with the Cumberland Coal and Iron Company."

CAPACITY OF TRANSPORTATION.

The Cumberland Company estimate that when all their boats are completed, and on the Chesapeake and Ohio Canal, with the aid also of transient boats, they can send to market by this avenue, 300,000 tons per annum.

"The coal transporting capacity to tide-water at Baltimore, of the Baltimore and Ohio Railroad, after the cars and power provided by the loan from this company are placed on the road, will not exceed 547,200 tons per annum. Three hundred thousand tons per annum will be required, under the contract with that company, by the Cumberland Coal and Iron Company alone."*

The expenses incurred for the productive power of the region, the carrying trade, and so forth, are estimated nearly as follows:—

Chesapeake and Ohio Canal,	$15,000,000
Baltimore and Ohio Railroad to Cumberland, and equipments,	10,096,571
Washington Branch Road,	1,500,000
Cumberland Coal and Iron Company,	1,650,000
Other investments by Companies, and individual operators,	450,000
	$28,696,571

This does not include the Railroad of the George's Creek

* The following is the present condition of the coal carrying power of the Baltimore and Ohio Railroad. It is necessary to premise, that the average time each car is employed in making the round trip from the mines to Baltimore and back, including loading and unloading, is three days. The power comprises 74 ten ton iron hopper cars, capable of transporting, per diem, $446\frac{66}{100}$ tons; 311 seven and one half ton iron and wooden hopper cars, capable of transporting, per diem, $777\frac{50}{100}$ tons; 360 nine ton old gondola cars, and 180 nine ton new gondola cars, capable of transporting, per diem, 1,629 tons—total $2{,}853\frac{16}{100}$ tons per diem. Estimating the working days of the year at 300, it will be seen that the present maximum coal transporting power of the Baltimore and Ohio Railroad is 855,900 tons per annum. The gondola cars, however, are frequently used for the transportation of other commodities, as well as for the special wants of the company. Those not thus employed, are devoted to supplying the coal stations of the company, the way sales of coal, and the local Baltimore market. After deducting their capacity, therefore, from the total, 1,224 tons will be shown to be the present per diem power of the coal transportation *to tide-water*—equal, for three hundred working days, to 367,200 tons per annum.

The above, of course, is exclusive of the 180 ten ton iron hopper cars, provided for by the funds of the Cumberland Coal and Iron Company, which will transport, annually, to Baltimore, 180,000 tons.

Coal and Iron Company, from Lonaconing to Westernport, eight or ten miles in extent.

The aggregate yield of Pennsylvania Anthracite last year, was 5,018,346 tons, and the extent and cost of most of the canals and railroads connected with that trade, and the transportation of that article, is as follows:—

	Miles.	Cost.
Lehigh Slackwater Navigation,	37½	$4,455,000
Lehigh and Susquehanna Railroad,	20	1,354,000
Mauchchunk and Summit Railroads,	40	400,000
Delaware Division of Pennsylvania Canal,	43	1,735,958
Beaver Meadow Railroad,	26	360,000
Hazleton Railroad,	10	120,000
Buck Mountain Railroad,	4	40,000
Summit Railroad,	2	20,000
Delaware and Hudson Canal,	108	3,250,000
Morris Canal,	102	4,000,000
Schuylkill Canal Navigation,	108	5,785,000
Philadelphia, Reading and Pottsville Railroad,	98	11,500,000
Little Schuylkill Railroad,	20	500,000
Mine Hill Railroad, with Laterals,	55	550,000
Danville and Pottsville Railroad (44 miles unfinished),	30	680,000
Mount Carbon Railroad,	7	155,000
Mount Carbon and Port Carbon Railroad,	2½	120,000
Schuylkill Valley Railroad,	14	300,000
Mill Creek Railroad,	6	120,000
Lykins Valley Railroad,	16	200,000
Wisconsisco Canal,	12	370,000
Swatara Railroad,	4	20,000
North Branch Canal, and Extension (unfinished),	163	2,790,310
Dauphin Company's Railroads (unfinished),	52	1,500,000
Railroads, by Individuals (estimated),	120	250,000
Railroads, underground (estimated),	200	250,000
Railroads, proposed or under way in the Coal regions,	100	300,000
Union Canal (estimated for Coal trade),		1,000,000
Total length, and cost,	1400	$42,034,268

To the above must be added $25,000,000, the estimated cost of the running stock and fixtures, on these several works, besides the cost (at least $5,000,000, for coal trade) of well-known works, omitted in the above table.

But it is not at Baltimore or Alexandria where the transportation of the Cumberland coal ends. We must follow it still further on its passage to a market. From the best sources of information within reach, it appears that during the year ending on the first day of January last, there were cleared from the port of Baltimore, loaded with Cumberland coal, nine hundred and seventy-eight sailing vessels, five steamers, and one hundred and thirty canal-barges—in all, eleven hundred and thirteen vessels of all classes.

During the same period, there were cleared from the port of

Alexandria, two hundred and eighty-seven sailing vessels, twenty-three canal-barges, and one steamer—in all three hundred and eleven vessels. The whole number of vessels of all classes, employed during the past year in the transportation of Cumberland coal from Baltimore and Alexandria, was, therefore, fourteen hundred and twenty-four.

There are many other points connected with a commercial consideration of this article of fuel, which we must at present pass over. Our aim is rather in this article, to notice some leading particulars relating to the Cumberland coal mines, and convey some adequate idea of the wealth invested in the development of those hidden treasures.

The Report of the Phoenix Mining Company which is before us, thus describes their operations on the vein and the works in the vicinity:

"The two openings in the vein are each 11 feet six inches in height, and eight feet in width, after leaving an upper seam of coal, measuring two feet six inches, for the roof. The first opening has been driven in 300 feet, and the second fifty feet. There are already about 1000 tons of a superior coal taken therefrom, which are piled up on the hill-side of the mine, ready to be sent to market, as soon as the company's inclined plane is completed, to connect the company's works with the George's Creek Railroad.

"This inclined plane is 2050 feet in length, on a descent of 700 feet. The coal will be let down this plane by a self-acting power, worked by a wire rope and iron pulleys, passing around two drums, brakes being attached to each. The plane has a double track its whole length, laid with a T rail of thirty pounds to the yard. The capacity of the train is sufficient to let down ten tons of coal every fifteen minutes; so that by working ten hours per day, 400 tons may be brought down daily, which amount may be very materially increased by an extra application of the ordinary mining force.

"The distance from the foot of the incline to the junction of the George's Creek Railroad, including the company's bridge over the George's Creek, of 75 feet, is about 280 yards: and from this point of connection of our works with the George's Creek Railroad to that of the Baltimore and Ohio Railroad at Mount Carbon, or Piedmont, is one and seven-eighths of a mile.

"The company have already erected eight houses on the Pleasant Hill property, which are at present occupied by about 100 workmen and miners; and two others are nearly completed —one of which is intended for the superintendent and the company's office.

"These works were commenced on the 10th day of January

last, and will certainly be completed and ready for business by the end of May, at a cost not exceeding $14,000."

The report of the Cumberland Company thus describes their own personal property and improvements :—

"In addition to vast primitive bodies of heavy timber, the surface embraces sixteen large and productive farms, most of them well fenced and in a high state of cultivation. Several of the farms are not excelled in point of agricultural value, by any of similar extent in the State. They are provided with seventeen dwelling-houses, — some of them large and commodious brick and frame structures—with all the requisite outhouses, including sixteen barns. Three saw-mills, capable of supplying all the lumber necessary for the works of the company, and a carding-mill, are located on streams that are as unfailing as those usually found in mountainous regions. Our locomotive road connecting the mines with the Baltimore and Ohio Railroad, and Chesapeake and Ohio Canal, at Cumberland, is 72,306 feet in extent, equal to thirteen and four-fifth miles, including the sidings, and branch road to the canal at Cumberland. It is laid with heavy rails, and is in good repair. There have been laid inside the mines, 26,285 feet of tramway, or horse-track railroad, and outside the mines, 17,067 feet, equal to eight and one-fifth miles in extent.

"The company owns three first-class coal-burning locomotive engines, and two of the second class, and 41 horses and mules. The equipments of the roads comprise 442 mine cars, 4 truck cars, and 68 from seven to ten ton, iron hopper, gondola, scow, and passenger cars.

"There have been erected on the lands of the company 152 dwelling-houses for miners; two churches, one of stone; one large brick school-house; a handsome stone dwelling and outhouses, for the residence of the engineer; six large stables, three granaries, one large machine shop, five blacksmith shops, three carpenter shops, six offices, one large storehouse, one large lumber house, two engine houses, five weigh houses,—sand, wood, and lime houses, as well as weigh scales, and scale houses; coal shoots, water stations, and, in short, all the fixtures, tools, and appurtenances requisite for the operations of the company.

"The farms, and miners' dwelling houses, store, &c., will yield a very handsome annual rental.

"At the head of the slope gallery, at the Eckhart mine, a large stationary engine has been erected, capable of affording all the power necessary for the mining operations at that opening. Seven mines have been excavated, and are in a workable condition, at various points on the company's lands. Combined, they are capable, at present, of a daily production of at least 2000

tons of coal. Six are entered by horizontal drifts, or galleries, made through the great vein, and the seventh is approached through a 'slope gallery,' which follows the dip of the coal, towards the axis of the basin."

ART. VI.—REPORT ON THE COPPER MINE OF THE NORTH CAROLINA COPPER COMPANY.

IT has long been known that copper pyrites, or the yellow sulphuret of copper and of iron, is found associated with the iron pyrites of the gold veins of North Carolina; but it was not known until the present year, that the copper ore occurred in sufficient quantity to authorize operations expressly for its extraction.

Through the enterprise of a few gentlemen now associated with the North Carolina Copper Company, the first proper copper mining operations were commenced, and their labors have already been crowned with great success.

The mine owned by the North Carolina Copper Company was originally opened with some success as a gold mine; but the copper pyrites was soon found to form so large a proportion of the vein as to warrant Mr. Fentress, the original proprietor, to offer the mine for sale in New-York as a copper mine; and it was purchased by several members of this company for the purpose of working it for copper.

The unparalleled success of the first mining operations—the production of a profitable cargo of good copper ore from the first shafts sunk, and before any regular levels had been excavated or grade work begun, is certainly quite unusual success; for it is very seldom that the preparatory operations of mining are repaid by the mineral raised in those operations; but more frequently assessments are called for on the shares to pay the cost of the work. Not only has your mine been worked without any call upon the shareholders for money, but a considerable profit is understood to have been realized from the sale of copper ore raised from the shafts constructed in the opening of the mine.

On the 25th and 26th of April last, I made a thorough examination of this mine, surveyed the vein, and measured it in all accessible places where it was exposed.

I found the rocks of the "country" to be a soft, bright, yellowish green talcose slate, very analogous to serpentine rock, overlaid by a variety of gneiss having hornblende in the place of mica—a rock sometimes called hornblende gneiss—and under-

laid by a fine-grained compact hornblende and feldspar rock, analogous to greenstone, but still not in the form of a dike, but of a regular bed.

In the midst of the soft talcose slate, occurs a large vein of quartz, accompanied with numerous smaller veins of the same material. The quartz veins in the little shaft A, form an aggregate of 2 feet 4 inches in thickness, one being 10 inches thick, another 8 inches, and a third 8 inches thick, and these veins converge towards each other as they dip towards the whym shaft B, and appear to unite with the great vein exposed in that shaft. Copper pyrites occurs abundantly intermixed with the quartz of all the veins.

The shaft A is sixty feet deep, and cuts the veins too near their outcrop to be in an advantageous position: still there has been obtained from it a considerable supply of copper ore, by working down the slope of the vein toward the whym shaft B.

The whym shaft was sunk still farther on the slope of the vein, but not far enough to allow of sufficiently extended working of stopes or grades. It was, therefore decided upon by the miners to sink a new shaft still further to the northwestward, in order to attack the vein at a depth of about two hundred feet. This shaft will be the engine, or principal shaft of the mine.

On descending into the whym shaft, I found that the vein of quartz rich in copper ore was 6 feet 7 inches thick, and that on its lower side there was a regular vein of clean copper pyrites 1 foot 4½ inches in thickness. The quartz vein itself was full of nests, and bunches of copper ore, mingled with a small proportion of highly crystallized tin-white iron pyrites, an ore which has not been analyzed, but which probably contains arsenic, and perhaps cobalt.

The great quartz vein, containing the copper ore, dips N. 25 degrees W., 35 degrees on the upper side, and 45 degrees on the lower side, thus presenting an opening of 5 degrees in the angle of the vein, a widening which is too rapid to be other than local.

There is evidently a tendency in the great vein to become more vertical in its dip; for while in shaft A the dip is but 15 degrees from the horizon, in the whym shaft B, 48 feet further N. W., we find the dip to average 40 degrees.

It is very desirable that the lode should have a more vertical dip, for the work of mining is much more simple on erect veins, since the perpendicular shaft work keeps longer near upon the vein, and therefore is less cross cutting required, and fewer winzes have to be sunk in the levels.

The situation of the mine is now such as to admit of extensive and profitable work, so soon as the levels are run on the plane of the vein in the whym shaft, and stopeing ground is thus

opened. Meanwhile, the engine shaft must be sunk at the point D in the section, and then you will have a new and deep cut upon the lode. There should be two gangs of miners employed; so that while the dead work in the engine shaft is going on, the mining operations on the lode at the whym shaft will pay for the dead work, as they will, and also yield a large profit besides.

The engine shaft will not cost more than $3000, if the vein holds its present inclination. It will strike the vein at the depth of 165 feet, if the dip holds at 35 degrees, and at 217 feet, if it proves to be 45 degrees. Should the vein pitch more perpendicularly, so that the engine shaft will not cut it at 217 feet, a cross cut is easily to be made to the lode, and there will still be an advantage in having that shaft at a low level, since it will drain off all the water from the mine. I shall therefore approve of the construction of the new shaft, as has been proposed by your head miner.

The whole thickness of the strata over the copper vein, I find to be 158 feet.

I made a survey of the vein, and, so far as practicable, have determined its course on the property of the company. I found that the course of the vein was N. 45 degrees E., S. 45 degrees W., and its dip is N. 25 degrees W.; from 35 to 45 degrees averaging therefore 40 degrees dip.

The length of the vein, if it extends on its course to the boundaries of the company's property, is 1810 feet; namely, 1452 feet to the south-westward of shaft A, and 358 feet to the northeastward of the same shaft. It cannot be known, of course, whether the lode is rich throughout the whole of this distance; but from the ascertained fact, that shaft C, which cuts the outcrops of the upper veins of shaft A, disclosed the ore as usual at that place, we may presume that the large vein below will be found to be rich also. The vein may be regarded as sufficiently proved for that distance, 310 feet.

There is abundant room for mining operations on the vein, now exposed by the workings already executed, to warrant the belief that the mine cannot fail to yield profitable returns for many years; and it is highly probable that additional discoveries will increase the value of these new mines.

The fact that, from a space twelve feet square, and five feet high, your miners, while excavating the shaft, extracted 50 barrels of No. 1 copper ore, which weighed about 800 lbs. per barrel, and the ore yielded 24½ per cent. of copper, will give some idea of the value of this rich copper vein, which is as yet not opened so as to give any thing like its full yield of ore.

I was informed, at the mines, that, in one place, a ton of No.

1 copper ore was extracted from a space 4 feet wide, 2 feet deep, and 5 feet high.

The books of the company, I suppose, will show the amount of ore sold to the smelters. This, it must be remembered, has been produced from the works done in the mere preparation of the mine, or the first part of its construction—not a single fathom of grade work having yet been executed, and hence no regular mining has yet been done. All the ore sent to market was obtained from an irregular level, thirty feet long, in shaft A, and from the bottom of shaft B, where no level is yet made.

I was informed at the mines that only six regular miners have been employed, and eight other good hands, not regular miners, who work mostly above ground.

There will soon be required about seventy-five regular miners to carry on the works when your levels are cut, so as to give room for workmen to operate.

You need to have buildings erected first for the accommodation of your men ; and this should be attended to immediately.

In putting up your steam engine, I would recommend to you the steam whym, like that used at the Bristol Copper Mines in Connecticut, which hoists and lowers by change of gearing, without stopping or reversing the steam engine,—an immense saving of power, since the fly-wheel may be used as usual to regulate the motions of the machinery. This friction steam whym has many advantages, which I shall not stop to enumerate, since they will be at once apparent, on inspection of one of the machines.

By sending a machinist to the Bristol Mines, it will be easy to procure the pattern.

In conclusion, I would congratulate the North Carolina Copper Company on the possession of the richest and best known copper mine in the Atlantic States, and one of the most productive since its opening was made. I have no doubt it will prove of great value to the stockholders.

The execution of the work of opening a mine is generally laborious, and requires several years. You have been singularly fortunate in having a mine that pays its own expenses, while the regular preparations for more extended workings are in progress.

Wishing the company all prosperity, I am, with great respect,

Your obedient servant,

CHARLES T. JACKSON, M. D.

Assayer to the State of Massachusetts and to the City of Boston,
State Geologist to Maine, New Hampshire, Rhode Island, and the United States.

JOURNAL OF MINING LAWS AND REGULATIONS.

AMENDED RULES FOR THE MANAGEMENT OF MINES ON THE ENGLISH COST-BOOK SYSTEM.

The *London Mining Journal*, to which we are indebted for the following system of rules for the management of companies, introduces them by saying:—

"The very great extension of the mining interest within comparatively a short period of time, and the vastly increased amount of capital invested in this description of enterprise, render any improvement, or suggested improvement, in their mode of management, of the utmost importance. The recent decisions, also, in some of our courts of law, have rendered the original Cost-book System of Cornwall to be looked at as less definitely confined to that county than heretofore had ever been considered the case. The following code of rules and regulations, carefully revised, by a barrister of high standing as a mining lawyer, has just been prepared for the Britannia Mining Company, and we insert them entire for the information and advantage of other mining companies:"

Resolved,—That in order more completely to establish the said company upon the Cost-book Principle, and more effectually to conduct its operations, the Rules and Regulations agreed to at a meeting of the proprietors and promoters, held on Thursday, April 15, 1852, be amended, and that the following amended Rules and Regulations be adopted for the future government of the company; such amended Rules, and no others, to be in force from and after this 18th day of February, 1853; that is to say:

1. That the name of the undertaking of the said company be "The Britannia Gold and Copper Mining Company," to be worked on the Cost-book Principle, and divided into 18,194 shares, that being the number of shares already issued.

2. That no person shall be recognized as a shareholder in the company, or in any way interested in the same, until he or she shall have been duly registered as a shareholder in the Cost-book of the company.

3. That any person holding any certificate or certificates of shares in the company, in respect of which such person is not now registered, shall be entitled to require the purser to register him or her as the holder of such shares at or before the expiration of one month, or some specified time, from a copy of these regulations being sent to him or her by the purser, if he or she be an original allottee of such shares, or if not an original allottee, at or before the expiration of three weeks from an advertisement containing the substance of this resolution being inserted in the *Times* and the *Mining Journal;* and upon such requisition being made, and such certificate or certificates being given up to the purser, the purser shall register such person accordingly, and in the event of his or her neglect or refusal to require to be so registered (unless such neglect or refusal be caused by illness, accident, or unavoidable delay), such person shall be deemed to have relinquished any claim he or she may have had to be so registered, and the share or shares in respect of which he or she had such claim may be re-allotted at a general or special general meeting of the company, on such terms and conditions as may be deemed expedient.

4. That any shareholder shall be entitled to relinquish his or her share or shares on giving notice in writing to the purser (which notice may be in the words and figures, or to the effect of Form No. 1 in the schedule to these rules underwritten or annexed), requiring the entry of such relinquishment in the Cost-book, provided he or she shall have paid his or her proportion of the costs and liabilities then incurred by the said company; and thereupon such shareholder shall cease to have interest in, or to be affected by, any liability to the company.

5. That any shareholder shall be at liberty to transfer his or her share or

shares on giving notice thereof in writing to the purser (which notice may be in the words and figures, or to the effect of Form No. 2, in the said schedule hereinbefore referred to, and must be signed by the transferror as well as the transferree, and duly attested), whereupon the transferree of such share or shares shall be entitled, on the delivery to the purser of such notice, by post or otherwise, to require the purser to register him or her in the Cost-book as the owner of such share or shares, and give his (the purser's) certificate accordingly.

6. That there be four general meetings of the shareholders in each year, to be held on the first Wednesday of the months of March, June, September, and December, at the hour of One o'clock, or any other convenient hour to be named and appointed, in London, at the mine, or elsewhere, of which seven clear days' notice shall be given by the purser to each shareholder; and at such meetings a statement of the debts, liabilities, and assets of the mine shall be laid before the meeting, with vouchers for all payments; and that minutes of the same be entered in the Cost-book, and signed by the chairman or the majority of the shareholders present.

7. That the committee of management, or any person or persons holding more than 2000 shares, may, by notice in writing, require the purser to call a special general meeting of the shareholders at the office of the company for the time being, by giving seven clear days' notice thereof to each shareholder; but at such special general meetings no other business shall be done or entered upon than shall be specified in the notice convening the meeting.

8. That any meeting may adjourn from time to time, as may be deemed expedient; but it shall be imperative on the purser, or such other agent as the shareholders may appoint, to convene a meeting of all the shareholders at least once in every three months.

9. That every shareholder, not in default as to payment of any calls, be entitled to a vote at all the meetings of the company in respect of every share held by him or her, and that all questions be decided by a majority of votes; the chairman of the meeting to have a casting vote, in addition to his own vote or votes.

10. That any shareholder, not in default as to payment of any calls, who may be prevented attending at any meeting, as aforesaid, be at liberty to appoint any other shareholder to vote and act for him or her by proxy, provided that every such proxy shall be in writing, and shall continue in force only for the particular meeting for which it shall have been given, or for any adjournment thereof.

11. That every general or special general meeting (subject to the provisions aforesaid of Rule 7) shall be at liberty to confirm in or remove from office any member of the committee, or other officer or servant of the company; to vary the number of such committee; to receive the accounts, balance-sheets, and reports of the committee and officers; to make any call or calls, provided that the amount of such call or calls shall not exceed the estimated expenditure of the company for the succeeding three months, in addition to discharging existing liabilities; to declare forfeited any share or shares upon which any previous call shall not have been paid within 14 days after the payment of the same having been duly demanded by the purser; to declare a dividend of surplus profits; to increase the number of shares in the undertaking, and to dispose of any additional shares at such prices as they may think fit; to change the name of the undertaking, and to remodel or abandon it altogether.

12. That the committee of management shall consist of not less than three shareholders, or more than seven; and that each member of such committee shall, at the time of his election, and during his continuance in office, hold 100 shares in his own right.

13. That at all meetings of the committee three shall form a quorum.

14. That any member of the committee shall be at liberty to retire there-

from at the expiration of four weeks from notice in writing of his intention to retire being given to the purser.

15. That whenever a vacancy shall happen in the committee, the remaining members thereof may forthwith fill up such vacancy by electing some shareholder duly qualified as aforesaid, who shall continue in office until the next general meeting, when such election shall be confirmed or otherwise.

16. That all questions which shall come before any meeting of the committee be decided by a majority of votes of the members present (each having one vote only), and that in case of an equality of votes, the chairman shall have a casting vote in addition to his own vote.

17. That the committee of management shall have power to do all acts necessary for the furtherance of the objects of the undertaking, so that such acts be in conformity with the principles of the Cost-book System, and the rules and regulations of the company.

18. That all mines, lands, tenements and hereditaments which shall be granted, demised, sett or leased for the purposes of the undertaking, shall be conveyed to or held by trustees for and on behalf of the company.

19. That the company hereby engage to, and do indemnify such trustees against all losses, costs, expenses, or damages whatsoever, which they may sustain or be put to, by reason of the covenants or conditions contained, or to be contained, in any lease, sett, conveyance or instrument, whereby any mines, lands, tenements or hereditaments may have been or may be conveyed to or held by them for or on behalf of the company, unless such losses, costs, expenses or damages, shall arise by or through the wilful neglect or default of them the said trustees.

20. That the amount of any call, duly made as aforesaid, upon each share be deemed a debt due from the owner of such share to the purser, which the purser is hereby authorized to sue for in the superior courts of common law, or the county courts; that in any action or plaint for the recovery of such debt, the production of a resolution entered in the Cost-book, purporting to be a resolution of a general or special meeting, to be signed by the chairman thereof, and to authorize any call, shall be *prmâ facie* evidence of such call having been duly made; that the production of the registry of the defendant as a shareholder in the Cost-book shall be *primâ facie* evidence of his being such shareholder at the time of such action or plaint being brought; and that no shareholder so sued for calls shall set up his or her partnership with the purser as a defence.

21. That all moneys and securities for money be deposited with the bankers of the company; that all payments for the undertaking be made by the bankers for the time being, and no payment be made by the bankers without a cheque, signed by two, at least of the members of the committee at a meeting, and countersigned by the purser.

22. That the general accounts for the current expenses of the undertaking be made up and entered in the Cost-book monthly.

23. That all notices, whether of general or special general meetings, of calls for money, or for any other purpose whatsoever, shall be, either by written or printed, or partly written and partly printed, circular from the purser, sent by post or otherwise, to the address of each shareholder, as entered in the Cost-book, and that notices so sent shall be effectual for every purpose.

24. That any alteration in, or addition to these Rules and Regulations, or any Rules and Regulations hereafter passed, shall only be made at a special general meeting of the shareholders; and any such alterations or additions shall be forthwith entered in the Cost-book.

25. That the Cost-book be kept by the purser, and be at all times open to the inspection and examination of the shareholders.

26. That all persons on becoming shareholders are subject and liable to the foregoing Rules and Regulations.

27. That a copy of these Rules and Regulations be given to each shareholder,

and that a copy of the resolutions of any meetings, and abstracts of accounts, shall be transmitted to each shareholder within ten days after any meeting shall have been held.

THE GOLD FIELDS REGULATION ACT OF AUSTRALIA.

The following is an abstract of the provisions of the Gold Fields Regulation Bill, passed by the Legislative Council of New South Wales, and transmitted to the Department of State at Washington, by J. H. Williams, Esq., United States Consul at Sydney:

The preamble states that the revenues derived from the gold mines and fields of the colony of New South Wales have been placed at the disposal of the Governor and Legislative Council of the colony for the public service; and that power has been given to authorize the Governor and Council to determine, subject to her Majesty's approval, the mode of raising the said revenues; and it is requisite that legislative provisions in aid of her Majesty's prerogative should be enacted for the management of the gold mines and fields, for enforcing the payment of fees and royalties, and for the preservation of order.

The 1st clause enacts that all rules and regulations at present in existence, or hereafter made by the Governor and Executive Council, respecting licenses to dig for gold, or claims for holding auriferous lands, and all terms and definitions appertaining thereto, which may not be inconsistent with the after provisions of the said act, shall continue to have the force and effect of law, provided that all such laws and regulations be laid before the Legislative Council within one month from the commencement of the next ensuing session.

Clause 2. That the government, with the advice of the Executive Council, may make rules and regulations authorizing leases or licenses for mining purposes on auriferous lands, to British subjects only, for terms not exceeding 21 years, on applications by tender, or upon biddings at auction; and to authorize auctions of single license allotments not previously taken up; provided that a preference shall in all cases be given to the discoverer of any auriferous run or tract of land.

Clause 3. That the Governor may suspend or cancel pastoral leases or licenses extending over gold fields, and also pay the lessee full compensation for loss sustained, or for improvements in the land, out of the gold revenue.

Clause 4. That all persons who shall mine or dig for gold, or shall carry on any trade, business, calling or occupation, except in connection with pastoral or agricultural pursuits, under lawful authority, or who shall reside in any gold field, shall be required to take out a license; excepting always persons holding leases on condition of paying a royalty on the gold procured, or the officers and servants of such persons, and also excepting women or children under fourteen years of age, who shall not be digging or mining for gold.

Clause 5. The license fee for British subjects on crown lands to be 30s. per calendar month, payable in advance.

Clause 6. The royalty to be reserved from British subjects mining on crown lands to be one-tenth of the gross produce of gold.

Clause 7. Amount of license fee and royalty charged by the crown on private lands to be one-half of the amount of that on public lands, and no license fee to be demandable from residents on private lands not directly engaged in mining.

Clause 8. Foreigners to pay twice the amount of fees and royalties taken from British subjects, and any alien obtaining any license otherwise than in accordance with this clause, such license to be deemed bad, and void, *ab initio*, and may be proceeded against under subsequent provisions of the act.

Clause 9. Only half the license fee to be payable after the 15th day of any month.

Clause 10. The Governor and Executive Council empowered to impose a license of £25 on persons applying for quartz veins and tracts of auriferous

lands, and the like fee upon the renewal of any such application, such fees to be both payable in advance at the time such application is lodged; to be returned if such application be not granted.

Clause 11. Commissioners may permit persons to cut tunnels, races, &c., without the payment of any license fee, provided they find security for the payment of the usual royalty on all the gold procured in the course of such works; and persons engaged in such works, and exempted from the payment of fees on them, who shall dig or work for gold otherwise, to be subject to double the ordinary penalties, and to all the forfeitures in the act.

Clause 12. No license or lease to be granted to any person who shall not satisfactorily certify to the commissioners that he has been duly discharged from his last place of service, and that he is not then under any continuing contract, or hired service, or apprenticeship.

Clause 13. Commissioners to determine the extent and position of claims within their respective districts.

Clause 14. Licensed holders of claims to be deemed in law to be the owners of them, except as against her Majesty, and all gold found on such claims to be deemed in law the chattel property of the holder.

Clause 15. Holders of tracts or claims to have power to transfer to any qualified or licensed person; such assignment or transfer to be certified to the resident commissioner, and an entry to be made of the same, for which a fee of ten shillings shall be made.

Clause 16. Persons holding licenses or leases, who may be convicted of felony or misdemeanor, or of being idle and disorderly persons, or of being rogues and vagabonds, unlawfully selling spirituous or fermented liquors, or of keeping gambling or disorderly houses, to forfeit their licenses; but no summary conviction for a common assault to subject the party convicted to the penalty and forfeiture imposed by this enactment.

Clause 17 imposes penalties as follows: All persons who, after the expiration of the first seven days in every month, or such earlier day to be named by the local commissioner, shall mine a day for gold without being duly authorized by lease or license, or carry on any trade, or reside in any gold field, &c., on conviction before two justices, shall pay for the first offence a sum not exceeding £5; for the second offence, a sum not exceeding £15 nor less than £5, and for the third and every subsequent offence, a sum not exceeding £30 nor less than £15.

Clause 18. All gold and gold ore, and all implements and apparatus ordinarily used for the procuring of gold, found in the possession of unlicensed miners, to be seized, and on conviction or flight of the offender to be forfeited, and the hut or building on his claim to be confiscated or destroyed, at the discretion of the commissioners.

Clause 19. All money or property acquired by unlicensed mining, which shall not have passed into the hands of a *bonâ fide* purchaser, to be confiscated.

Clause 20. That all persons employing or permitting persons to dig for gold, except under the conditions before mentioned, on their lands or claims, shall be liable to the same penalties and forfeitures as are imposed upon unlicensed persons digging or mining.

Clause 21 imposes the same penalty on persons allowing unlicensed persons to work in gold claims in partnership with them, or otherwise in their company.

Clause 22. Owners of private lands suffering persons to mine or dig before proclamation, or without notice being given to the commissioner, to be liable to a penalty not exceeding £50.

Clause 23. Licenses to be produced on demand; or if withheld, the party withholding to be held to be an unlicensed person, and subject to the penalties to which unlicensed persons are liable.

Clause 24. That the commissioner and his assistant may apprehend and detain any unlicensed person mining or digging for gold.

Clause 25. That any justice of the peace may issue a warrant, on sufficient information, against any person suspected of offending against the act, or, at his own discretion, a summons, in the first instance, and may take sufficient bail for his due appearance before him.

Clause 26. Commissioners to determine complaints of encroachments in a summary way, and to award reasonable costs to the successful party; and if the complaint of encroachment be substantiated, the trespass of the parties, their goods and implements, to be removed by the commissioner or his assistants, and any person resisting them to be liable to a penalty not exceeding £20.

Clause 27. Persons holding a lease or license authorizing them to mine or dig for gold on payment of a royalty, and who may defraud her Majesty of any portion of the royalty reserved in his lease or license, or shall conceal gold found by him, or falsify his accounts, to be deemed guilty of a misdemeanor, together with all officers and servants of such licensed person who may knowingly be concerned in such fraud.

Clause 28. Persons counterfeiting licenses, or personating licensed persons, to be subject to a penalty of not less than £10 nor more than £50.

Clause 29. The act not to abridge or control, except by express words, or necessary or obvious implication, the royal prerogative, or the authority of the commissioners.

Clause 30. Commissioners in respect of gold mines and fields to have like powers over private lands as over the waste lands of the crown.

Clause 31. That in default of payment of penalties, the offender be imprisoned with or without hard labor, or kept to hard labor on the roads or public works for a period of two months, if the penalty do not exceed £5; for four months if the penalty be above £5 and under £15, and for six months if the penalty be above £15.

Clause 32. That no formal information needs to be filed for any penalty, &c., under the act; that the informer shall be a competent witness; that no information shall be quashed for want of form, or be removable by any person into the Supreme Court.

Clause 33. That all actions for things done in the execution of the act, by any justice or commissioner, or their assistants, shall be brought within three months of the act committed, and one month's notice be given to defendant; and if notice shall have been made to the plaintiff of sufficient amends before a trial, or the money paid into court, damages shall not be recovered, and the defendant be entitled to costs.

Clause 34. That in this act the words mining and digging shall mean any mode whereby the soil, earth, rock, or stone, shall be disturbed, carried, carted, worked, &c., for the purpose of obtaining gold; provided that nothing in the act shall be construed to prevent any preliminary search or examination, commonly called prospecting; and that the term British subject shall include all subjects of the British crown, by birth or naturalization, or under any certificate granted under the 11th Victoria, No. 39.

Clause 35. That the act shall take effect from and after the 1st February, 1853, and continue in force until the end of 1854.

THE LOCAL MINING LAWS OF CALIFORNIA.

A Bill was introduced into the Legislature of California at its recent session, " To provide for the Enactment and Preservation of Local Mining Laws." Of its adoption there can hardly be a doubt, though we have not seen its passage expressly stated. The language of the daily press respecting it is in these words: "We are glad to see this evidence of good sense on the part of our Legislature, the provisions of the bill being so wholesome in their operation, and so well adapted to the wants of the miner, and fitted to the existing emer-

gency, that its final passage is established beyond cavil or doubt." And, again. "Such are the provisions of this law. The equitable provisions upon which it is adjusted must be apparent to all. It cannot but be productive of much good to the class for whose interest and protection it was framed."

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Section 1. In each township in the several mining counties of this State a convention shall be held on the first Monday of June of the present year, and on the first Monday of June of every year thereafter, for the purpose of making laws, rules and regulations for the government of the several mining localities or districts in such township; which regulations, if not inconsistent with the laws of this State or of the United States, shall be in force in such township for the period of one year from the date of their adoption, and until modified or repealed by a subsequent convention.

Sec. 2. The Justices of the Peace in the respective townships shall designate the place at which such convention shall be held, and shall give public notice thereof, by publishing the same in some newspaper in the county one month previous to the holding of such convention (if any newspaper is published in the county), and post notices of the same in three conspicuous places in different parts of the township.

Sec. 3. The Justices of the Peace shall determine whether said conventions shall be held by the miners of the township in mass meeting, or by delegates to be chosen in the various mining districts or localities of the township: if the latter, then the said Justices shall give notice as aforesaid of the time and manner of electing said delegates; *Provided*, That the number of delegates to which each district or locality shall be entitled shall be in proportion to the number of voters in said district.

Sec. 4. It shall be the duty of the Justice of the Peace whose name stands first in alphabetical order in each of the townships, to call said conventions to order at the time and place designated as aforesaid, and read this Act to the persons present: after which the convention shall proceed to elect a President and Secretary.

Sec. 5. A copy of the rules and regulations adopted at such convention by a majority of the miners present, shall be certified to be correct by the officers thereof, and the Justice of the Peace calling such convention shall append his certificate to the same, that the convention at which such rules and regulations were passed was regularly called in accordance with the provisions of this Act, and said certified copy shall be forwarded immediately to the County Recorder of the county in which such township may be situated, who shall record the same in a book to be kept by him for that purpose, which shall be kept open for the inspection of all persons interested, during the usual business hours of the day. The Justices of the Peace in each township shall keep a certified copy of the rules and regulations aforesaid, which shall also be published at least four times weekly in some newspaper in the county, if any be published therein. The expenses of the publication and record, as provided in this section, shall be a county charge, which shall be allowed by the Court of Sessions or Board of Supervisors of the county.

Sec. 6. In actions respecting "mining claims," a copy of the record herein provided for, certified by the County Recorder or Justice of the Peace, shall be taken by the courts of justice as evidence in regard to the rules and regulations of miners of the respective townships, and such rules and regulations so proven, when not in conflict with the constitution and laws of this State or of the United States, shall govern the decision of the action.

MINING LAWS OF NEVADA COUNTY, CALIFORNIA.

THOSE Regulations which exist in the various mining districts of California, have been adopted at public meetings of the proprietors and miners of the dis-

tricts. They are generally so well sustained by public sentiment as to possess the force of laws. There is a general similarity in the regulations of each district. The following are those in force in Nevada county, one of the richest mining districts of the State:—

A convention of quartz miners recently held at Nevada, after full deliberation and long debate, adopted the following code of mining laws for the government and regulation of quartz mining:—

Art. 1. The jurisdiction of the following laws shall extend over all quartz miners and quartz mining property within the county of Nevada.

Art. 2. Each proprietor of a quartz claim shall hereafter be entitled to one hundred feet on a quartz ledge or vein; and the discoverer shall be allowed one hundred feet additional. Each claim shall include all the dips, angles, and variations of the vein.

Art. 3. On the discovery of a vein of quartz, three days shall be allowed to mark and stake off the same, in such manner by name of the owner and the number of the claim, or otherwise, as shall properly and fully identify such claims. Parties having claims may cause a map or plan to be made, and a copy filed with the Recorder, if deemed requisite more particularly to fix the locality.

Art. 4. Work to the extent of one hundred dollars in value, or twenty days of faithful labor shall be performed by each company holding claims, within thirty days from the date of recording the same, as provided for in article 6th of these laws; and the duly authorized representative of a company making oath that such money has been expended, or that such labor has been performed, shall be entitled to a certificate from a County Recorder or Deputy, guaranteeing undisputed possession of said claims for a term of one year; and a like sum of money or amount of labor expended or performed within the first twenty days of each succeeding year, duly acknowledged as herein named, shall entitle the claimants or company, from year to year, to further certificates of undisputed proprietorship and possession; and a company having a mill contracted for in good faith, to the amount of five thousand dollars, for the working of its claim or claims, the proper representatives of the company making oath of the same, shall be entitled to receive from said County Recorder, a title deed to the said claim or claims, guaranteeing to the claimants or company, their successors and assigns, undisputed possession and proprietorship for ever under these laws; provided that nothing in this article shall be at any time inconsistent with the laws of the United States.

Art. 5. Whenever the requisite amount of money or labor, as provided for in Article 4, has not been expended within thirty days from the adoption of these laws, the claim or claims thus neglected shall be considered abandoned, and subject to be re-located by any other party or parties.

Art. 6. Any person, a citizen of the United States, or any person having taken the necessary steps to become a citizen of the United States, shall hereafter be entitled to hold one quartz claim as provided for in Article 1, and as many more as may be purchased in good faith for a valuable consideration, for which certificates of proprietorship shall be issued by the County Recorder.

Art. 7. The regularly elected County Recorder of Nevada County, shall serve as Recorder for this county in quartz claims, authenticating his acts by the county seal; he shall appoint as his deputy, such person for Grass Valley as may be elected by the District of Grass Valley; and he shall pass his records to his successor.

Art. 8. The fees of the Recorder and Deputy shall be the same as the statute fees for recording per folio.

Art. 9. No title to a claim hereafter taken up or purchased shall be valid, unless recorded in the books of the aforesaid County Recorder or Deputy within ten days after its location or purchase.

CALIFORNIA TITLES.

The only case directly contesting the validity of the usual titles in California was decided a short time since, and is thus reported:—

"The long vexed question of the rights of holders of quartz and building lots to hold them in fact from other uses by placer miners, or other persons, was decided in favor of the lot holders, at Grass Valley, before Justice Davis, the past week. The quartz claims of the Gold Hill Co., had been seized by a party of sluicers, which was the cause of action. The verdict was in favor of the Gold Hill Co., with $50 damages. This establishes a very important principle."

COMMERCIAL ASPECT OF THE MINING INTEREST.

New-York Mining Board—Sales of Mining Stocks—Copper Mining News—Copper Stocks in Boston—Boston Mining Share List—Estimation of the Mining Interest in England—Deficient Supply of Coal—Reasons upon which Apprehensions are based—Prices of Lead at Galena.

In presenting a careful and accurate commercial review of the mining interest of the country in its details, we shall be obliged to take some further time in order to complete the arrangements requisite to do justice to the subject in each monthly issue. In this number, therefore, we shall not attempt more than to touch upon certain prominent points of importance, if we may except the commercial intelligence in Boston, which will be found quite full and complete.

In this city the organization of a Mining Board for the sales of stock, has been quite recent, and the sales thus far, not large. Already indications are given of the importance this Board is destined to assume. Many of the companies whose stock is there quoted, are quite new, and are consequently dealt in to a limited extent. They have scarcely had sufficient time to become known to the public.

At present, the transactions in Mining Stocks are dull, with scarcely an exception, unless it be that of Ulster Lead Company. The smelting at the mine has commenced, and the company are about to receive their first shipment of lead; and expect, hereafter, to average something like 400 tons weekly.

In the metal market, at reduced prices, sales of late have been active, with considerable firmness.

The news here from the copper mining region of Lake Superior, is very briefly contained in the following extracts of a letter from W. H. Stevens, Esq., engineer at Eagle Harbor, under date of June 3d, 1853:—

"The mines in this district are doing very well. Cliff will ship this month about 160 tons, and follow it up for months to come. North American has extensive masses in sight; the mine will make a good dividend-paying mine: Copper Falls also, there is no doubt about it. The Summit bids fair to equal any thing ever opened in the district; the vein is from two to three feet in width, and well filled with copper.

"Toltic is the favorite of the Ontonagon, and is, without doubt, one of the best mines in the country. You can hold the stock for $25 without fear. Norwich is also a good mine, and will pay.

"The Manitou looks full as well as I expected to see it. The work has not been driven as fast as I wish, but will be hereafter. The vein is about two feet,

and well charged with fine copper. I shall expect to cut the vein at a point within 30 days, when it will show some good pieces of pure copper.

"The Washington is a good mining property; you can hold without any fear. The company now have a large territory of good and valuable mineral land, and a few days will show the copper. I feel confident, that if the mining work is driven with due energy, the stock will be held at from $8 or $10 within 12 months.

"The New-York and Michigan Company has opened their mine to a considerable extent, and it looks well; masses of over 1500 lbs. are found. The vein is well defined, and I think the stock must advance as soon as the value of the mine is understood."

Boston, 10th June, 1853.

The following table will give a condensed view of the market for copper mining stocks during the month of May, together with the number of shares in each company, and amount paid in per share. Thus far in June, the market has been heavy and unsettled, most of the shares experiencing a still further decline, as compared with the price of May 31. The details are of little interest with the exception of a few companies.

Pittsburg (Cliff) is steady at about 170, and Minnesota 210; both of these being dividend paying companies, the amount of stock thrown upon the market is small, and holders have full confidence of their permanency as an investment. Copper Falls comes next, and its prospects are fully equal, if not superior, to any of the non-dividend paying stocks. The amount of copper being produced by each of these companies, is well known to be large, and in excess, we think, of the expectations of their most sanguine friends.

The success of the National Mine, since their commencement in September, 1852, has been greater than that of any other mine, during the first nine months of its operations, and the prospects still continue favorable. The stock of this company is very scarce, 28 being bid and none offered. As yet only $2 per share has been called in.

The North American is also doing remarkably well, and the market value of the stock is 71 bid, with but little stock for sale. There are no particular features of note in relation to any of the other stocks, some of which are doing quite well, and others less so.

Public confidence is strong in the faith that the resources of the Lake Superior mining region are almost unlimited, and when fully developed, will more than meet the expectations of those who are investing their money in copper mining stocks.

Several gentlemen of this city will leave on the 14th of June, for Lake Superior, in order to make themselves practically acquainted with operations there, and to investigate the real value of the mineral region. It is presumed that this visit will not only be of benefit to the participators, but become the means of deriving information which shall bring greater evidence before the public of the solid worth of copper mining stocks.

BOSTON MINING SHARE LIST.

Fluctuations for May, 1853, in twenty-five different Mining Stocks, sold at the Boston Stock & Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Mining Stocks, Boston.	Shares.	Paid in.	Highest Sales.	Day Mo.	Lowest Sales.	Day Mo.	Value, May 31	From April 30. Gain.	From April 30. Loss.	Share Sold.
Adventure, Copper	10,000	$10,00	6¼	25	4	8	7	$2¼	$—	215
Algomah, "	10,000	,50	6¼	18	6¼	19	4½	—	1	455
Bay State, "	20,000	,50	—	—	—	—	2	0	0	No sale.
Copper Falls, "	10,000	11,00	56*	10	45	3	56	7½	—	970
Dana, "	20,000	,62½	3¼	5	2	28	2	—	1¼	2,722
Forest, "	10,000	8,80	23¼	14	20	27	19	—	3	3,048
Fulton, "	100,000	2,00	3	7	2¼	16	1½	—	¼	550
Glen, "	10,000	2,00	3½	9	3	20	3	0	0	121
Isle Royale, "	12,000	2,00	12	24	12	24	13	3	—	45
Malone, *Sandstone*	40,000	3,00	3½	9	2¼	31	2½	—	1¼	10,715
Manitou, Copper	20,000	,25	—	—	—	—	2	—	1½	No sale.
Minnesota, "	3,000	22,00	213	24	209	23	210	0	0	68
National, "	10,000	2,00	25	13	21	10	28	3	—	90
Native, "	10,000	1,75	4½	2	3¼	28	4½	—	¼	700
N. American, "	10,000	17,00	65	9	60	5	72½	12½	—	70
Norwich, "	20,000	—	9	23	9	23	8½	—	½	50
North Western, "	9,000	10,00	18	24	17	2	17½	0	0	95
Phœnix, "	10,000	5,00	12½	11	12	21	12	0	0	415
Pittsb'g (Cliff), "	6,000	18,50	180	19	175	1	170	—	10	6
Ripley, "	40,000	2,00	2½	14	2¼	14	2½	—	¼	100
Shawmut, "	20,000	,50	2½	13	1½	11	2	—	½	3,505
Star, "	20,000	,50	2½	31	2	19	2½	—	1½	190
Toltic, "	20,000	3,00	14½	5	11	18	12½	—	¼	5,965
Winthrop, "	20,000	,25	3	6	2	31	2	—	¼	4,964
West Castleton, *Slate*	50,000	6,00	6½	11	6¼	18	6½	—	1½	525

Assessments have been laid on several companies as follows:

	Amount of Assessment.	When Payable.
Dana	$0,50 cents per share,	July 1st.
Forest	1,70 " "	July 1st.
Native	0,50 " "	June 10th.
Shawmut	0,50 " "	June 15th.
Winthrop	0,50 " "	June 20th.

The vast extent and growing importance of the mining interest in the estimation of capitalists in England is very strongly stated by the *London Mining Journal.* By the share list ten years ago, the number of English mining companies known in the market was under 50; while the present number is 520 British, and, including the Australian and Californian gold companies, 50 foreign distinct mining enterprises, involving the investment of capital to the enormous extent, in round numbers, of £15,000,000. This comprises £5,231,350 in British, £4,294,860 in miscellaneous foreign, and £5,058,500 in gold mining adventures; to which may be added the balance, £415,290, as investments in private mining enterprises, quite independent of coal or iron. The above £5,231,350 employed in the development of British mineral wealth, consist of £1,409,060, invested in dividend-paying mines; £2,345,624 in mines which have sold produce, and £1,476,666 in adventures which have not sold ores, showing a marked predilection on the part of capitalists for young and promising mines, although not at present working to a profit.

* $3 per share assessment was paid in on the Copper Falls, May 9.

The supply of coal for the demands of the market during the next winter is beginning to attract notice. By some, it is said there will be a deficiency of Anthracite, while others assert this to be the annual prediction, made about this time in the year. Six months yet remain during which much may be done. We think it due, however, to the readers of the *Mining Magazine*, to state the grounds upon which this apprehension is founded. They are, that every branch of manufacturing industry which could cause a consumption of coal is in a high state of prosperity, especially the iron manufacture. The average annual increase in the consumption during 1851 and 1852 was 820,108 tons. Supposing the same increase for 1853, what are the existing means for supplying such demand? Such is the question raised by those apprehending a short supply, and it is answered in these words:—

In the early part of the year it was supposed that the Lackawanna region might possibly increase its product 125,000 tons. Owing to strikes among the laborers and the boatmen, it has now become doubtful whether there will be any increase. We will assume, however, an increase of 75,000 tons. It was also supposed that the Lehigh region might increase to about the same extent as the Lackawanna. But the delay in the opening of the Delaware division of the State canals has rendered it hardly possible for this increase to exceed 75,000 tons. We will, however, assume it to be 100,000, fully one-half of which, we learn, will be required on the line itself. This gives us, as the utmost, a possible increase of 175,000 tons from the Lackawanna and Lehigh Coal regions, for the year 1853, and throws upon the Schuylkill region the necessity of an increase of 645,108 tons, in order to equal the average rate of 1851 and 1852. The product of the Schuylkill region, however, thus far, is actually 60,000 tons less than it was to the same date last year. What, then, is the prospect of completing, before the close of navigation, the tonnage required?

		Tons.
The actual arrears in the product of the Schuylkill region to this date,		60,000
The increase over the total product of last year necessary from this region,		645,108
The quantity transported in 1852, from June 1, to Dec. 1, (the close of the shipping season,)		
By Reading Railroad, (about)	1,000,000	
By Schuylkill canal,	590,900	1,590,000
Total,		2,295,108

That is to say, these two companies will be required to transport 2,295,108 tons before the first of December next, in order to reach the average increase of 1851 and 1852. There now remains 25 weeks of the season. The amount required to be brought down by 25, will give the rate per week.

	Per week.
If the increase equal the average of the last two years, the amount to be brought from the Schuylkill region the rest of the season is	92,204 tons.

The quantity of coal transported by the two works last week (the largest business thus far this season) was 58,444 tons. The largest quantity ever transported by the Schuylkill canal, in any one week, was less than 28,000 tons, and by the Reading Railroad less than 55,000 tons.

The Schuylkill Company estimated, in the early part of the season, that they might increase 125,000 tons, but to this date there has been no increase.

Two questions, therefore, naturally arise, of vast importance to many interests, viz., 1. Can the quantity of coal indicated in the above table be mined during these twenty-five weeks? 2. Can it be transported to market, if mined? To both of these questions a decided negative must be returned. If the increase

equals the average of the last two years, the amount can neither be mined nor transported.

The *Pottsville Miner's Journal*, of June 11th, located in the heart of the Anthracite region, states the following particulars relating to this subject:

The trade is beginning to assume a serious aspect. There remain but 25 weeks up to the first of December, and the supply from all the regions is behind the quantity furnished to the same period last year; and from the three principal regions, it is short about 100,000 tons.

The deficiency from the Schuylkill region, so far is	57,889 tons
From the Lehigh, ...	22,350
	80,239

The *Honesdale Journal* of last week states, that "from the Lackawanna region very little coal has reached the Hudson so far this season. The strikes among the different classes of workmen have delayed business greatly. If no more strikes occur the amount carried forward will equal that of last year." It will require an increase of 6,500 tons per week for the ensuing 9 weeks, to make up the deficiency from this region, which leaves but 16 weeks of the season; and an increase of 8000 tons per week over the shipments of last year would only give an increase of 128,000 tons from this region. The Lehigh will in all probability increase 100,000 tons, and the Pennsylvania and Lackawanna may increase say 75,000 tons, which, we learn, is all they claim under existing circumstances. This would give an increase from the three principal regions of only 303,000 tons, and about one-half of the whole increase from the Lehigh will be required on the line of the works short of tide.

The shipments by the Delaware and Hudson Canal Company and the Pennsylvania Coal Company to May 29th, were as follows:

Delaware and Hudson Company, ...	47,342 tons
Pennsylvania Coal Company, ...	35,526
	82,868

Making only 82,868 tons. We have not the quantity sent to same time last year, to make a comparison, but judging from the above extract from the *Honesdale Journal* it is considerably behind the quantity sent to market last year to same period.

The great activity in trade and manufactures of almost every description, particularly iron, will cause a considerably increased demand, amounting to not less than 500,000 tons at the lowest estimate. It is true the mild weather which prevailed last winter left a larger overstock in the market than was anticipated—but the increased supply last year over the previous year was 522,000 tons—and all intelligent persons seem to agree that the demand will be increased this year over former years, not less than 200,000 tons for manufacturing and steam marine purposes alone. After making an allowance for the additional overstock April 1, say 200,000 tons, we will have to increase the supply at least 600,000 tons over last year's shipments for the balance of the season to make up this deficiency and supply the market. This would require an increase of 24,000 tons per week over the shipments of last year, which, we believe it is impossible for the coal regions to furnish, in the ensuing 25 weeks, unless the miners and laborers work more regularly than they now do. Our readers must also bear in mind that the stoppage of the trade for a single week in these regions would affect the supply to the amount of at least 120,000 tons. Consumers abroad, therefore, had better lay in their winter supplies early in the season, if they desire to save money. We hardly think that they will be able to purchase coal, this year at least, cheaper in the fall than they can now. All the indications of the trade are directly the reverse.

The views entertained in the coal region at the commencement of the present year, respecting the prospects of the trade and the demand, were of the most exalted kind. The anticipations of the miners were certainly up to the demand which will probably be made upon them. We quote again from the same Journal of an earlier date:

"These, together with many others, which we have only room to mention, such as the increased demand for the use of locomotives traversing our numerous railroads—the increase of ocean steamers—the great multiplicity of stationary engines, &c., cannot fail to affect the coal trade very advantageously, and will call for an increase, at the lowest estimate, of 800,000 tons the present year, from the different Anthracite regions, to supply the market. In 1847 the trade increased 638,317 tons, which was over 20 per cent., but as soon as the revenue measure of 1846 began to be felt, it remained almost stationary until 1851, having increased only 374,000 tons in three years. In 1851, it increased 1,026,831 tons, and last year, 544,814, which will average about 20 per cent. increase for each year. With the prospects before us, we can safely put down the increase for the next five years at 20 per cent., which would give the following results:

For 1853,	5,995,356 tons.
1854,	7,194,427
1855,	8,634,312
1856,	10,361,174
1857,	12,433,405

More than doubling the trade in five years!

Startling and surprising as this result may appear, we feel confident that it will be realized. The trade more than doubled from 1843 to 1847, and similar causes (protection to American Industry, whether brought about by levying duties, the gold mania or other causes) will produce similar results hereafter."

But our object was, at this time, merely to allude to this subject, and to state the grounds upon which a short supply was anticipated by those who apprehended it. Six months yet remain, as we have said, in which to obtain the year's supply.

William Heanstead, Esq., has furnished the *Galena Gazette* with the subjoined statement of the average prices of lead and mineral for eleven years past, commencing with January, 1842, and closing with December, 1852:—

AVERAGE PRICES OF LEAD AND MINERAL PER 1000 LBS., FOR THE YEARS—

	Lead.	Mineral.		Lead.	Mineral.
1842	$2 24	$12 85	1848	$3 54	$19 82
1843	2 34	12 60	1849	3 67	22 18
1844	2 80	16 88	1850	4 20	24 10
1845	2 96	17 67	1851	4 08	25 51
1846	2 89	17 33	1852	4 12½	25 87
1847	3 17	19 16			

From this it will be seen that the price of lead has advanced since 1842, 84½ per cent., and the price of mineral during the same time, 100 per cent.

PRICES OF LACKAWANNA COAL IN THIS CITY PER CARGO,—JUNE, 1852.

Furnace Lump	$4 35 per ton.
Steam Lump	4 45 "
Grate	4 55 "
Stove	4 55 "
Retail	5 00 "

JOURNAL OF GOLD MINING OPERATIONS.

CALIFORNIA GOLD FIELDS AND MINES.

The gold region in California has been generally designated by the terms Northern Mines and Southern Mines. The northern comprising those in the neighborhood of the Sacramento River, which flows from the north, and the southern those mines and diggings on the confluents of the San Joaquin, which flows from the south.

The yield of these regions, since the first discovery of gold to the commencement of the present year, has been $148,881,546. Of course this comprises only that of which we have any reliable statements. The amount taken away by passengers on the steamers and ships from San Francisco, and to Mexico and elsewhere overland, is estimated previous to December, 1851. Subsequently, we have only that manifested by steamers.

April, 1849, to December, 1850	$68,587,591
Jan. to December, 1851	34,492,634
" " 1852	45,801,321
	$148,881,546

The news from all the mining regions is of the most encouraging nature. The winter rains are over; the rivers and streams are full; the weather invites labor; the gold turns up amply to repay it, and the California papers state that the Spring prospects of the miners were never better.

The Miners' *Advocate* says that the largest lump ever found in the State was taken out of Dr. Carpenter's claim, at the Columbia House, about five miles above Coloma. It weighs over 100 pounds, two-thirds of which is supposed to be quartz.

INEXHAUSTIBILITY OF THE GOLD.

There is much interesting information in the following recent letter from a miner in the Southern Mines:—

"Among the topics which form the theme of discussion around many an evening camp-fire, as well as among you city folks, who have the newspapers to aid you, the durability and extent of the auriferous deposit is always one of prominent interest. In 1849 we thought we "knew it all," when we supposed the gold was chiefly confined to the gulches and streams. We afterwards learned that it extended to the flats, and, last of all, that it lay embosomed in the hills, and was even to be found in rich deposits upon their surface. And how few of our hills have ever been thoroughly prospected! how few, indeed, have been prospected on the surface, to say nothing of tunnelling! There is a hill in my immediate neighborhood that within two or three months has been found to be quite rich on the surface, paying from $8 to $20 per day to the man, that dozens of men had been in the habit of walking over every day for more than a year without imagining that it would pay "grub money." And is it not reasonable to suppose that there are hundreds of such hills in California that will be prospected and worked when facilities for water are afforded, as they will be? And does not common sense teach us, judging from the past, that an immense amount of gold will yet be taken from the bowels of the mountains by the means of tunnels and deep shafts? Already is the work of

tunnelling on a large scale being commenced in this section, where little or nothing has been done in that way before. One company intend to pierce the hill on which Sonora is built. Another, the Spring Hill Co., commenced last fall to drift under a slide on Wood's Creek, above Sonora, but were driven off by the wet weather, and during the winter the tunnel fell in. They intend to commence operations again.

"From the discoveries they made last fall, they have no doubt but the undertaking will prove a profitable one. Again: within a year past it has been discovered here that blue and yellow clay, which in many places is supposed to be "bed," and worthless, is often richer than the gravel or loam that covers it, and pays to a great depth. It was formerly supposed that the gold could not sink into the clay to any depth, but recent discoveries seem to indicate that the clay itself is often formed from the quartz, and that gold, instead of sinking into it, has always been in it from its formation. I am acquainted with many parties that have gone down from ten to twenty feet in the clay, and found it to pay better and better as they went down. In some instances the clay has been found to pay where nothing could be found in the earth above it. Some machinery better than is now employed generally, for grinding and washing clay, will doubtless be discovered, when clay washing will become an important part of mining.

"And lastly, in estimating the durability of the mines, we must take into consideration the vast number of quartz veins that exist in the State, and that are likely to prove productive when proper machinery is procured to work them. The great reason why quartz apparatus have heretofore proved unsuccessful is the fact that the mills employed were not of sufficient power. Good substantial mills, however, are now being erected in many places. The Santa Rosa mill, situated on Matelot Gulch, is said to contain the heaviest machinery of any of the mills in the United States, with but one or two exceptions. Two very heavy mills are also being constructed at Sonora, which are to give employment to about 500 hands.

"Mining should now be made a regular and steady business, and the policy governing the miners should be regulated with respect to this: the State, instead of encouraging the emigration of ignorant and degraded Asiatics, that only intend to remain for a season, but who, nevertheless, will help to keep out an enlightened and permanent population, should offer every inducement for the settlement of families in the mines. Such a policy will prove, in the long run, the most conducive to the prosperity of every part of California—the cities as well as the mines—the merchant as well as the miner."

A QUARTZ CRUSHING MILL.

The mill is composed of 12 stampers, or pestles, 2 mortars, a shaft having 36 cams, together with the (at present) most approved method of amalgamating, embracing the use of blankets, ripples, double shaking tables, shaking pan, &c. The stampers are of the hardest chilled castings, being 8 inches square on the face of each, making the whole crushing surface 768 square inches, and their weight is 700 lbs each, or, in the aggregate, 8,400 lbs. This tremendous weight is made to fall from a height of 14 inches upon the bottoms of the mortars 50 times per minute, or there is beating upon the mortars each minute of time 420,000 lbs. equal to 210 tons. The mortars are solid castings, and weigh 1,700 lbs. each. With this machinery in operation, rightly attended to, the company have put through the mill, in 24 hours, 60 tons of a mixture of rock and what is called pay dirt; but this great amount is by no means uniform, as nearly every thing depends upon the manner in which a mill is "fed;" and, in the present instance, the nicest care had been taken to test its capacity. In the ordinary course of crushing, however, it is possible easily to crush 30 tons of rock in 24 hours, and, in cases where there is much dirt with the quartz, a still larger amount.

COST OF A CRUSHING AND SAW MILL.

The following estimate or statement of expenses is for a quartz mill like that described above, accompanied with a saw-mill. The engine in this instance is a forty-horse power. The statement, it should be said, is based upon the expenses of last year, and is entitled to a deduction of a fourth or fifth to conform to present rates in California.

To attend to running the engine and keep up steam requires two engineers at $150 per month each—$300 per month. To keep the saws in order and run them night and day requires eight sawyers at $100 per month—$800 per month. To attend to piling away lumber, cutting slabs, &c., requires four men at $80 per month—$320 per month. The cost of the lumber delivered at the mill in logs is about $9 per thousand feet; sawed and piled up, about $18 per thousand feet. To attend to the quartz mill requires four feeders at $80 per month—$320 per month; one amalgamator at $200 per month; two assistants to the feeders to break the rock suitable for the mill, at $80 per month—$160 per month; one mechanic to attend to keeping the wood-work of the mill in repair, at $150 per month; one blacksmith at $100 per month; one superintendent, $300 per month; wear and tear to quartz mill, $15 per day; to saw-mill and machinery, $10 per diem; cost of fuel for burning rock and for the engine—four cords at $5 per cord—$20 per diem. As to the expense of raising rock, it varies so much upon the different hills, consequent upon the conditions, the presence of water, the depth of the ledge, its thickness, and the nature of the soil, that it is almost impossible to arrive at it. As a matter of economy, we have found it to our advantage to have rock raised by the ton, as by so doing, we obtain more work from the men, and the rock is better selected and freer from dirt than when raised by day laborers, who, while they take their own time in working, are indifferent to every thing except accumulating a pile of rock and dirt together. Our rock from Ophir Hill costs us $10 per ton for raising, and $2 per ton for hauling, making $12 per ton at the mill. We have had rock from other hills, the cost of raising which was $5 per ton. At the rates of labor for the past year, however, the average cost of raising rock has been about $10 per ton. When labor becomes cheaper, and rock can be raised for from $3 to $5 per ton, hundreds of quartz ledges that will scarcely warrant the working now, will be opened, and can be made to pay most profitably. The following is a synopsis of the foregoing expenses:—

2 Engineers at $150 per month—$300 per month, or	$11 50	per diem.
8 Sawyers at $100 per month—$800 per month, or	30 75	"
4 Men, outside, at $80 per month—$320 per month, or	12 30	"
12 M. feet in logs	108 00	"
4 Feeders to Q. M. at $80 per month—$320 per mo., or	12 30	"
1 Amalgamator at $200 per month—$200 per month, or	7 69	"
2 Assistant Feeders at $80 per month—$160 per mo., or	6 15	"
1 Carpenter at $150 per month—$150 per month, or	5 76	"
1 Blacksmith at $100 per month—$100 per month, or	3 84	"
Wear and Tear at $650 per month—$650 per mo., or	25 00	"
Incidentals at $130 per month—$130 per month, or	5 00	"
30 Tons of Rock	360 00	"
Total expenditures	$588 29	per diem

To produce 12,000 feet of lumber, and to extract the gold from 30 tons of quartz.

It is necessary to remark that, in making up expenses they have been governed by the prices for labor the past year, which have been at least 20 per cent. higher than at present, or probably will be for the future. The difference in the value of labor now, would make a material reduction in the amount of expenditures.

A GOLD MINING COMPANY DISSOLVED.

We believe that provisions are not generally made in the charters of mining companies for their dissolution. Such occurrences do sometimes happen, as in the case of the Burn's Creek Freehold Gold Mining Company. The suggestions made by the *London News* in the account of the dissolution of this company, are too valuable to be overlooked.

Notice has been issued that at a meeting of the shareholders of the Burn's Creek Freehold Gold Mining Company, "held pursuant to advertisement on the 16th ult., at the seat of the company at Paris," it was resolved unanimously that the company should be dissolved, and the capital returned to the shareholders, "after deducting the expenses in the terms provided by the act of society." It is accordingly notified by the *Gerant*, that as soon as the accounts can be made up the affairs of the association will be liquidated, and the return duly made to the shareholders. This undertaking was brought out a few months back with a highly colored prospectus, from which we subjoin one or two extracts:

"At the moderate calculation of the crushing of 100 tons of quartz per day, calculating the production at 15*l.* per ton, and allowing one-third for working expenses, the annual profit would be equal to a dividend of upwards of 300 per cent. to the shareholders. The committee have entered into a contract with the proprietor for the purchase of this valuable estate, on terms which they consider extremely advantageous, namely, the allotment of 40,000 shares, to be delivered when the company shall have received from their own agent a satisfactory report of the property, and have been put in actual possession; and a further allotment of 30,000 shares, to be delivered on an increase of capital, under the powers of extension vested in the company, with an option to reserve the same until after payment of the first dividend to the shareholders. The present capital of the company will be divided into one hundred thousand shares, of 1*l.* each paid up, of which thirty thousand shares are to be allotted in England and thirty thousand in France. The affairs of the company will be managed under the immediate supervision of the committee in London, assisted by the committee in Paris. A competent agent and suitable mining staff will be dispatched forthwith to the mines, to take possession on behalf of the company, if the survey is entirely satisfactory. As this undertaking will be carried on under the French law of partnership, *en commandite*, no liability is incurred by the shareholders beyond the amount of their subscriptions."

It is understood that the dissolution of the association is owing to the report of the company's agent not being satisfactory. In the interest of the public we cannot refrain from again calling attention to the objectionable practice, adopted by men high in position, of bringing out a company, and then sending out an agent to report upon the property. It is a mere mockery and a delusion to place such implicit trust in the statements of owners of alleged mineral estates and their agents, who rarely fail, in the race for premiums, to pick up something out of the scramble, even in cases in which the directors are sufficiently prudent to retain for a certain period of time the shares reserved for the vendors. There is no necessity of our pointing these remarks at this company in particular, for several flagrant cases have lately occurred, in which the statements of the vendors have been proved false, and the original shareholders, besides being subjected to the inconvenience of lying uselessly out of their money for months, have finally been mulcted of a considerable proportion of their deposit under the the guise of expenses. In the original prospectuses, it may be mentioned, the contingency of a winding up and deduction is very rarely referred to. On the introduction of all new mining projects, especially those connected with our colonies or foreign parts, it is to be hoped the public, warned by the instances lately observed, will have the good sense to mark those which are brought forward on the faith of the mere vendors, without the sanction of qualified home mining engineers. Before any man of character

puts his name to such a prospectus, he ought to make it his business to see that full and trustworthy reports on the property have been made, before inflicting on subscribers, who are attracted by a respectable directorate, a series of disappointments resulting in actual pecuniary loss.

SPURIOUS AND CURIOUS GOLD SPECIMENS.

Several specimens of late have been presented at this office, having a specific gravity of from 13 to 15. They represent placer gold. They have been made as follows:—The inner part being an alloy of gold and silver, copper and bismuth, and then passing them through melted gold of a fine quality, thus giving a very heavy coating to the outside. The second class of specimens have been made of inferior gold containing considerable silver, and while in a melted state it appears to have been run into and through a spongy mass of quartz sand and ferruginous clay, making them quite natural. After which they have been fumed with certain gases, in order to give them a darkish appearance, similar to gold carried for some time in a leather purse.

Mineralogical Assay Office, San Francisco, April 20th, 1853.

AUSTRALIAN GOLD FIELDS.

This vast island contains the English colonies of New South Wales, on the eastern side (so called from a fancied resemblance to South Wales in Great Britain); Western Australia, or Swan River; South Australia, or Port Adelaide; and Port Philip, or Victoria, lying at the southeastern point of the island.

It is in the adjoining colonies of New South Wales and Port Philip that the extraordinary discoveries of gold have been made.

This immense island appears of a *diluvian* rather than a volcanic origin; but one comparatively recent active volcano is known, viz., Mount Wingen in New South Wales. On the east sandstone strata lie in beds, one on the top of another, in the most regular manner, their original relative situation evidently never having undergone any change. Some of these beds are of regular thickness, and consist of thin lamina, which incline at a considerable angle to the northeast.

Mr. Jukes says, that the mountain chain on the east coast has an axis of granite with occasional large masses of greenstone, basalt, and other igneous rocks. It is flanked on both sides by thick beds of palæozoic formations, chiefly sandstone, but also containing limestone and coal.

Port Philip or Victoria, as it is now called, and New South Wales, abound in mineralogical treasures; gold, copper, iron and coal have been found, particularly the latter, which exists in several districts, but especially in the country south of Hunter's River, New South Wales. The field is extensive, and the sea cliffs present a most interesting section of this stratum.

By the census taken in 1851, New South Wales contained about 200,000 inhabitants; Victoria, 70,000, and South Australia, or Adelaide, about 70,000; the remainder of the island, 40,000. Of the cities, Sydney in New South Wales had a population of 60,000; Melbourne in Victoria, 24,000; Adelaide, South Australia, 14,000. The New South Wales gold mines are,

1. The Ophir and Turon mines in the Bathurst District, across the Blue Mountains to the westward of Sydney, and distant about 130 miles.

2. The Hanging Rock, about 30 miles from Tamworth on the Peel River, to the northwestward of Sydney, and distant about 250 miles.

3. The Tuena Diggings, on the Abercrombie River, to the southwestward of Sydney, distant about 140 miles.

4. The Braidwood or Araluen Diggings, to the southward of Sydney, distant about 140 miles.

In all these localities, which it must be evident, from the distances and directions indicated, comprise altogether a vast extent of country, considerable quantities of gold have been found—sometimes near the surface, and at others, at a depth varying from ten to thirty feet.

In Victoria, the richest gold districts are Mount Alexander, 70 miles from Melbourne, and Ballaret, near Geelong.

In South Australia a gold field has been found within 16 miles of Adelaide.

The estimates of the yield of these gold fields, although varying somewhat, reach nearly £20,000,000.

The Melbourne Argus of January last, made the following estimate up to that time:

Since our previous summary there has been brought down by escort as follows:—

	Ounces.
By government escort from November 18 to December 27, . .	154,746
By private escort, ...	227,431
Amount conveyed to Adelaide by November escort, ...	43,875
Ditto by December escort, ...	27,033
Ditto by October escort (previously omitted), ...	42,019
Total, ...	495,104

The following statement exhibits the total amounts brought down by the escorts from their establishment to the end of 1852:—

BY GOVERNMENT ESCORT.

	Ounces.
From October 1, 1851, to August 26, 1852, ...	896,810
From August 26 to September 25, ...	128,830
From September 25 to November 15, ...	225,358
From November 15 to December 30, ...	154,746
Total, ...	1,405,744

BY PRIVATE ESCORT.

	Ounces.
From June 21 to August 21, ...	207,588
From August 21 to September 25, ...	197,959
From September 25 to November 15, ...	245,981
From November 15 to December 30, ...	227,431
	878,959
Conveyed to Adelaide by escorts, ...	228,529
Total conveyed by escorts, ...	2,513,232

But this amount by no means represents the total yield of our gold fields. In a previous summary we proved that a large proportion of the precious metal was carried from the diggings by private hand, by comparing the amount known to have been brought to Melbourne by the far larger amount actually shipped from the port. Our first summary showed the result of a very careful estimate as proving that up to the end of August last the total yield of gold was 2,532,422 oz. The escorts have brought down since then as under:—

	Ounces.
From August 26 to September 27, ...	366,193
From September 27 to November 15, ...	471,339
From November 15 to December 30, ...	495,104
Total, ...	1,332,636

But to this amount something must be added for the quantity conveyed by private hand within that period. Of course no definite data exists for ascertain-

ing this; but it will not be over estimated by taking it at ten per cent. of the whole quantity brought by escort. The totals would, therefore, stand thus:—

	Ounces.
Estimated total of the yield up to August, ...	2,532,422
Conveyed by escort since then, ...	1,332,636
" private hand, ...	133,263
Estimated grand total of the yield up to 30th December 1852,	3,998,321

We may say in round numbers, 4,000,000 *ounces, which at* 70*s. per ounce, is* £14,000,000 *sterling; but its intrinsic value is certainly more, nearly* £16,000,000 *sterling; or* $80,000,000. *The world has never, perhaps, exhibited so astounding a result as these figures show.*

Subsequently in February it uses the following language:—

"The statistical table drawn up by Mr. Westgarth, exhibits as accurately as possible the produce of the Victoria mines up to the end of last year. It will be seen that the total represents the astonishing amount of FOUR MILLIONS AND NINETY THOUSAND OUNCES, at 75s. per oz."

The London *Daily News*, of the 22d of May, thus sets down the amount:

"At the end of 1852 it is calculated that the value of the precious metal exported from Victoria was no less than £16,000,000, from Sydney, £3,500,000; total, £19,500,000—or, in round numbers, £20,000,000 sterling. The yield in the beginning of 1853 was quite in proportion, if not larger. The population of the Australian colonies is now probably close on 700,000, and from them it is anticipated that in 1853 will be collected the enormous revenue of £3,000,000 sterling. That of Victoria will reach £2,000,000; that of Sydney, £600,000; that of Van Diemen's Land, about £200,000; that of New Zealand, now that large gold fields have been discovered, will doubtless make up the difference. Here we may say, almost without a metaphor, that a nation is born in a day."

Since February there has been a decrease in the yield, in consequence of an arbitrary Act of the Legislature of New South Wales "to regulate the raising of a revenue from the gold mines of New South Wales." Its effect has been to create disorder, and drive persons from the diggings at Turon. Its aggressive features are these:—

"Under pretext of preventing runaway servants from digging, it empowers the authorities to demand from every one proofs that he is not an absconder, and to imprison him until he can produce such proofs, and all this without any one to bring against him a complaint. It thus, contrary to the whole spirit of British law, throws on the innocent party the *onus probandi* of his innocence, and deems him guilty without proof of guilt. This is one of the offensive provisions. Another is, that it requires every adult male remaining in any district proclaimed as a gold field, unless engaged in pastoral or agricultural pursuits, or in tunnelling, to take out a license, as if he were a digger, of 30s. a month, every male being reckoned adult above 14 years of age—so that all persons carrying on any kind of trade in the township must not only pay licenses for themselves, but for every one in their employ. And it empowers the authorities to fine or imprison all such male persons found on the ground who have not taken out a license. The effect is, to prevent enterprise, and to raise the cost of necessaries, so as to make digging, to the great majority, a profitless labor. And a third objectionable clause is one that makes the fee double to a foreigner, and puts the *onus probandi* upon every person who may be accused of being such. The act has numerous points of a very pernicious character; but these may suffice to indicate the whole."

NEW ZEALAND GOLD FIELDS.

New Zealand forms a group of two large and numerous small islands belonging to the Australian continent. The larger islands are mountainous, and some of the peaks are quite high, and are active volcanoes. Pumice stone, coal,

green talc, iron stone, sulphur, slate, granite, marble, &c., are found. Numerous samples of this gold had been received at Sydney, but it was not as pure as the Australian gold. The field is thus described in letters received at Sydney:—

"The place is called Coromandel, about 35 miles by water from Auckland. There are fifty people now at work, and from the samples which are in town, procured from the surface of the earth, it appears very rich, and shows as good prospects from the 'surface working' as either California or Port Philip. There is no mistake about the gold being in the country, as it has been fully proved by the various pieces of quartz which have been found fully impregnated with gold. I was the first escort of gold to Auckland for sale, as you will see per newspapers sent.

"The gold is chiefly in bluish quartz, with very sharp fracture and pointed angles, showing that it has not rolled far. It cannot be called dry digging, as there is a rill giving sufficient water for working a 'Long Tom.' The water course has evidently been larger, but has been filled by a slip from the hill above, which brought down rotten wood, and vegetable mould, and a quantity of gold-bearing quartz. The whole hill-side, slip and all, is overgrown with forest, which, with the thick underbrush, prevents the immediate tracing of the slip along its course to the spot whence it brought the fragments of the gold vein. As diggers, however, open out the pits, they will be able to follow the 'deposit vein' to its source, where they will probably find the bed-rock denuded by the force of the slip; or, if overgrown and covered with a thin coating of mould, which prevents our at once finding it, a very little digging will expose it, and it will be found to consist of gold in matrix, or the auriferous vein itself. My reasons for the supposition are these: The gold quartz here is very soft, hence it is a surface-quartz. The nuggets are not rounded in the least, but sharp at the corners. The quartz is not in sites, but mixed with rotten wood, stones, &c., and even with fern-root, the whole forming a different color.

"Mr. Heaphy, the gold commissioner, has arrived in town, bringing along with him 28 oz. 16 dwt. 20 gr. of gold and golden quartz. These, we are informed, are mere specimens to satisfy the public mind that gold is to be had for the digging; and that the industrious and enterprising are earning extremely handsome wages."

GOLD IN NORTH CAROLINA.

Dr. Daniel Ashbury, of Charlotte, N. C., has recently published a report on the gold and copper mines of Gold Hill, Rowan Co., N. C. From the statistics given by Dr. A., it appears that the Gold Hill Mines have afforded $1,500,000 since their discovery in 1843, and that their exploration has led to the growth of a village of above 800 inhabitants, situated directly over the mines. The gold region covers about one square mile. The veins are numerous, well defined, of large size, and are judged to be of unending depth, as they are entirely vertical in their positions. They are already down in some places as deep as 350 feet. The average yield of the ore, by the first process, is $1 50 per 100 lbs. The sands are then re-washed five times, by different parties.

FROM THE ARKANSAS GOLD REGION.

During the past week the gold fever has raged in this region to a considerable extent. New discoveries are constantly being made. Gold in small quantities has been found in the valleys, on the hill tops, and indeed in almost every place where search has been made. Scarcely a rock can be found that does not contain some sign of gold.

No one, so far as we can learn, pretends to doubt the existence of gold in this vicinity. The only question with us now is, whether it will be found in sufficient quantities to pay for working it. Those who are best acquainted with mining operations are the most sanguine upon the subject.—*Ouachita Herald May 20th.*

JOURNAL OF COPPER MINING OPERATIONS.

COPPER.

Pure Copper is of a light reddish brown color, and of a high lustre. The native copper is found in beds, veins, and detached masses and grains, in solid rock, and imbedded in loose soil. It is distributed over the whole surface of the globe, and nowhere is found more generally, or in larger masses, than in the United States. It occurs in New England, New Jersey, Pennsylvania, Virginia, North Carolina, and, in the greatest abundance, at Lake Superior, near Kewenaw Point, at the Ontonagon River, and other localities of that region. It occurs chiefly in trap, or sandstone, rock, or near their junction, in the form of injected veins. The usual copper ores are the sulphurets and the oxides.

The alloys of copper possess more interest than all others:—20 copper and 1 tin is a flexible, tenacious alloy, good for bolts and nails; 9 copper and 1 tin was ancient bronze; 7 to 1 is hard bronze; 16 copper to 1 tin is a soft bronze, and bears drifting, rolling, and drawing; 12 copper and 1 tin is metal for mathematical instruments; 8 to 1, bearings for machinery; 9 to 1, a strong metal, the most tenacious of the series; 5 copper and 1 tin is very hard, crystallized, and good for hard bearings. Copper 16 and 3 tin is a soft metal, for bells; 1 tin and 4 copper is for house bells; 7 tin and 32 copper is for Chinese gongs; 9 tin and 32 copper is for large bells. Speculum metal ranges from 1 tin and 2 copper to equal parts of both. Copper 80, tin 20, is common statue bronze; 92 copper, 8 tin, is bronze for models; 85 copper, 14 tin, and 1 iron, is the composition of ancient weapons.

Zinc and copper form brass, 50 copper and 50 zinc. Gilding metal is 1 to 1¼ ounce of zinc to 1 pound of copper; Manheim gold, pinchbeck, 3 to 4 ounces of zinc to a pound of copper; 8 zinc and 16 copper is a fine brass. Any proportion between 50 zinc and 50 copper and 37 zinc 63 copper, will laminate well, and make good sheets; 50 copper to 52 or 58, forms Mosaic gold; zinc 8 and 1 copper, forms a white metal, little differing from zinc, except in tenacity; this alloy is stronger than pure zinc. Copper and zinc appear to mix in all proportions; the extremes of both assume the characters of the principal metals.

Most of the American copper is smelted from the native copper of Lake Superior. This metal which occurs mixed with gangue, consisting chiefly of silicious rock, is cut into small lumps that may enter the furnace; these are in some instances of a ton in weight. Or, if the metal is disseminated through a mass of the rock, either in grains or in small veins, it is pounded and washed in the stamping mill, and so far concentrated that the sand contains from 70 to 75 per cent. of copper. This is called stamp work, and is sent in barrels from the mines to the smelt works, where it is smelted, chiefly in reverberating furnaces.

Smelting of copper is done by two distinct methods; the one is in reverberatories, the other in blast furnaces. When reverberatories are used, the ore is assorted and purified like all other ores. The first step is to calcine it, which is done by a heat of 12 to 15 hours, with occasional stirring at intervals of two hours. The second process is to smelt the ore, which takes about four hours.

The slag is skimmed from the top, and the metal afterwards drawn off. The third operation is smelting the metal of the second process with the slags of the fifth process. The fourth operation is still a smelting process, by which the metal becomes a rich mass. The fifth operation is a heating of the metal of the former process gently until it melts, when it is repeatedly skimmed. The sixth process is that of refining or toughening the metal.

PRODUCE OF THE PRINCIPAL COPPER MINES OF CORNWALL AND DEVON, ENGLAND, FOR THE QUARTER ENDING MARCH 31, 1853.

	Tons.	Amount.
Devon Great Consols	6,076	£46,725 18 6
Wheal Buller	8,063	21,906 7 0
Wheal Basset	2,211	20,622 16 0
Tincroft	8,298	15,425 17 6
United Mines	2,477	14,748 17 0
Consolidated Mines	1,829	12,804 8 6
Carn Brea	1,866	12,587 16 6
West Caradon	1,028	12,161 10 9
Par Consols	1,150	10,784 5 0
North Pool	1,463	10,207 11 6
Wheal Seton	1,482	9,709 10 6
Fowey Consols	991	9,836 10 0
Alfred Consols	809	9,189 18 6
North Roskear	1,120	8,746 10 6
South Caradon	715	8,601 0 6
South Frances	885	7,172 1 6
Perran St. George	1,546	7,098 4 6
North Basset	628	5,755 9 6
Halamaning and Croft Gothal	763	5,511 6 6
St. Day United	628	4,670 1 0
Condurrow	614	4,605 6 6
South Tolgus	577	4,529 5 6
Bedford United	482	4,418 6 6
East Crofty and Dudnance	695	4,884 18 6
Wheal Friendship	882	4,221 5 6
Levant	578	8,698 4 0
Phœnix Mines	280	8,885 16 6
Treviskey	508	8,172 5 6
East Pool	680	2,999 13 0
Wheal Clifford	264	2,955 10 0
Hingston Down	810	2,822 1 0
Holmbush	860	2,464 11 6
West Bassett	478	2,436 10 6
Creegbraws	862	2,899 4 0
Botallack	231	2,818 2 6
Marke Valley	411	2,178 14 0
West Treasury	262	2,134 11 6
Dolcoath	888	1,776 5 0
Tresavean	428	1,592 12 0
Great Wheal Alfred	214	1,548 6 6
Wheal Arthur	157	1,368 14 6
Wheal Crebor	124	1,320 19 0
Pembroke and East Crinnis	185	1,277 8 0
Camborn Vean	221	1,198 18 6
Tremayne	211	1,165 12 0
Gonamena	102	1,141 13 0
Tavy Consols	166	964 4 0
Wheal Ellen	186	896 18 6
Wheal Speedwell	99	884 6 6
West Alfred Consols	162	847 0 0
West Seton	101	774 8 0
Crane and Bejawsa	78	764 0 0
Trethellan	228	735 0 0
Comford	228	728 12 6
Prideaux Wood	170	721 15 0
West Fowey	67	705 8 6
Callington—Kelly Bray	120	689 18 6
Wheal Franco	148	680 4 0
Providence Mines	102	670 11 6
Tywarnhaile	166	670 1 6
West Providence	44	665 10 0
Trebarvah	100	648 14 6
West Damsel	100	622 2 6
South Crinnis	82	607 7 0
Feock Regulus	45	543 7 6
Wheal Squire	88	528 0 0
Treleigh Consols	84	513 12 0
North Damsel	59	477 16 6
Tamar Slag	85	£455 4 6
North Downs	57	417 10 6
East Seton and Maude	66	418 19 6
East Crowndale	86	404 19 6
West Wheal Alfred	63	866 19 6
Carvanall	63	864 16 6
East Wheal George	47	856 4 0
Wheal Busy	54	822 1 6
Gustavus	44	815 14 0
South Crenever	68	814 10 0
Hawke's Point	102	805 14 0
Devon and Courtenaye	81	802 18 0
Wheal Vyvian	42	274 17 6
Wheal Guskus	23	259 18 0
Hawkmoor	40	249 0 0
St. Aubyn and Grylls	27	236 18 6
Cook's Kitchen	44	229 18 0
Boscaswell Downs	27	224 15 6
Wheal Agar	86	197 14 6
Wheal Jewell	81	192 14 6
Devon and Cornwall United	38	188 8 0
East Tolgus	88	178 7 0
North Buller	28	172 4 0
Pentire Glaze	25	171 17 6
Cwmdyle Rock	25	165 8 0
Wheal Carpenter	17	157 9 6
Wheal Harriett	26	154 1 0
Wheal Henry	25	146 17 6
Wheal Robins	15	146 12 6
Wheal Langford	28	143 14 0
Wheal Trefusis	18	143 0 6
North Wheal Busy	16	188 16 0
Pendarves Consols	18	188 18 0
Wheal Plenty	21	129 18 6
Wheal Brewer	21	24 8 6
Great Wheal Leisure	23	112 6 6
Trannack and Bossence	23	104 0 6
West Stray Park	10	100 15 0
Camborne Consols	6	98 0 0
Wheal Bedford	50	83 15 0
Wheal Mary	30	82 10 0
West Trethellan	22	82 10 0
East Wheal Leisure	25	79 7 6
Wellington Mines	15	76 17 6
Wheal Mandlin	24	76 4 0
Great Crinnis	5	73 17 6
Wheal Neptune	9	72 4 6
East Unity Wood	9	69 16 6
Wheal Prosper	17	66 14 6
Polgooth	10	64 5 0
Duke of Cornwall	15	58 10 0
Rosewarne	11	57 17 0
Grambler and St. Aubyn	14	58 11 0
Grenville	5	51 7 6
Gorland	8	46 16 0
North Wheal Unity	3	38 17 0
Trenance	2	37 0 0
Great Wheal Charlotte	51	35 8 0
Wheal Virgin	18	34 2 6
Wheal Abraham	58	29 17 6
Richard's Ore	5	27 5 0
Wheal Susan	2	20 8 0
Craze's Ore	3	18 10 0
Great Towan	4	5 6 0
Jackson's Ore	34	5 2 0
Total	47,712	£346,779 18 6

LAKE SUPERIOR COPPER MINES.

We place the following Table for 1850, from *De Bow's Review*, in the pages of the *Mining Magazine*, to serve for reference rather than for any special value in itself. We hope, in a subsequent number of our Magazine, to offer a similar table of the present condition of the Lake Superior mines in all their details. The contrast between them would most strikingly indicate their progress. The yield for 1852 was 2,500 tons, against 1,525½ tons in 1850.

Lake Superior Companies.	Nature of Mines.	Capital.	Kinds of Power used.	No. of Male hands.	Quantity produced Annually.	Nature of Product.	Value of Product.
					Tons.		
Northwest Mining Co. . .	Copper	$50,000	Water . .	114	80	N. Cop.	$17,000
Copper Falls Mining Co. .	"	65,000	Horse . .	80	10	N. Cop.	8,000
Northwestern Mining Co. .	"	10,000	Hand . .	14	—	—	—
North American Mining Co.	"	70,000	Steam . .	110	85	N. Cop.	17,000
Albion Mining Co. . . .	"	15,000	Hand . .	9	—	—	—
Cliff Mine	"	207,860	Steam & Horse	180	1,028	N. Cop.	157,000
Lac le Belle Mining Co. . .	"	28,000	Horse . .	6	10	Gr. Ore	600
Iron City Mining Co. . .	"	1,500	" . .	15	—	—	—
Isle Royale Mining Co. . .	"	14,000	Steam . .	19	—	—	—
Cape Mining Co.	"	500	Horse . .	6	—	—	—
Pittsburgh and Isle Royale Mining Co.	"	18,000	Hand . .	25	2	Ingot.	760
Liskanett Mining Co.. . .	"	30,000	Horse . .	25	25	N. Cop.	7,500
American Mining Co. . .	"	3,000	" . .	15	½	N. Cop.	190
Ontonagon Mining Co. . .	"	15,000	Hand . .	20	—	—	—
Sistagna Mining Co. . . .	"	3,000	" . .	10	—	—	—
Chesapeake Mining Co. . .	"	5,000	" . .	10	—	—	—
Minnesota Mining Co. . .	"	29,000	Steam & Horse	80	257	N. Cop.	77,100
Algonquin Mining Co. . .	"	2,400	Hand . .	28	—	—	—
Ridge Mining Co.	"	5,000	Horse . .	16	5	N. Cop.	1,250
Adventure Mining Co. . .	"	15,000	" . .	16	8	N. Cop.	2,000
Forrest Mining Co. . . .	"	15,000	" . .	30	5	N. Cop.	1,000
Ohio Trap Rock Mining Co.	"	15,000	" . .	10	10	N. Cop.	2,500
Merchant Mining Co. . .	"	2,000	" . .	1	—	—	—
TOTAL	. .	$618,760	. . .	789	1,525½	. .	$386,960

IRON MINING.

Name of Company.	Capital invested.	Tons of Iron Ore.	Value Raw Material.	Kind of Motive Power.	No. hands employed.	Tons of Pig Iron, &c.	Value of Products.
Kalamazoo Co. . . .	$14,000	1,890	$2,362	Water . .	10	630	$16,000
Union City Iron Co. .	15,000	2,700	7,000	" . .	25	600	15,000
TOTAL . . .	$29,000	4,590	$9,362		35	1,230	$37,000

The copper is now found in masses, some loose, weighing over six tons; in veins of various thickness; and in ores mixed with rock. The mines are generally worked by shafts, till a vein is hit, when it is followed, the copper cut out with chisels, and raised to the surface.

THE MINNESOTA COMPANY.—This company have made their annual report. The product of the year ending January 1, 1853, was 523 tons, or an average of 43½ tons per month, showing an increase of 70 per cent. over the previous year. Of this, however, only 313 tons was marketed, on account of low water in the Ontonagon River. This yielded 74 per cent. of pure copper. The estimated amount of copper on hand at the mine and at the mouth of the river, on the 1st of March last, was 493 tons, worth probably $225,000. The actual expenditures for mining last year were $108,000. The surplus of the company is stated at $125,245, equal to $40 per share. The estimated production

of the next twelve months is 750 tons, or about 50 per cent. increase upon last year. The aggregate amount of mineral raised since the opening in 1848, is 992 tons, valued at $330,700. The deepest shaft is 267 feet, and the aggregate shafts 1,010 feet; aggregate drifts, 3,545 feet. The real estate of the company consists of 1,315 acres of mineral land. Upward of 70 buildings have been erected, and the population consists of 312 persons.

THE CLIFF MINE.—A letter dated in March to the *London Mining Journal*, states. "The Cliff Mine will ship about 1,600 tons, yielding from 65 to 70 per cent. Going through the mine, I saw several large masses of pure copper, from thirty to forty tons weight. One mass, in particular, I noticed extended from the sixth to the seventh level below the adit, and there is more than one hundred tons exposed, which they cannot blast down, and they are engaged in cutting it out of the vein. I took up one of the clips and measured it, and found it thirty-eight inches long, perfectly pure. The mine is wonderful, and improves as it goes down."

Another letter from the Sault dated in May says:—"The Cliff Mine has at the lake shore 1,300 tons, and will, by the close of navigation, ship 1,800 tons, which will enable it to pay about $325,000 this year."

The Detroit *Tribune*, of 24th May, says—"The propeller Globe arrived at this port from the Sault Ste Marie, having on board a cargo of two hundred tons of mass copper; some of the masses, which were of the purest and richest specimens of native copper ever taken from any of the mines, weighed between three and four tons. It was from the Cliff and the Minnesota Mines. The cargo was probably the most valuable ever brought to this city, being worth, at the market value of $700 a ton, the round sum of one hundred and fifty thousand dollars. About fifty tons of it was landed at the smelting works at the lower part of the city, and the balance was shipped to Pittsburg. We understand from letters received from the copper regions, that there are now ready for shipment, at the various mines, about two thousand tons, worth one million four hundred thousand dollars.

COPPER FALLS MINE.—This mine, in the spring had several large masses exposed, amounting to about twenty-five tons. The superintendent writes:

"We have not yet made the cut through the mass in shaft No. 4, Hill Mine. I expected when I last wrote you, that we should ere this get a part of it out of the mine. It is twenty inches thick, pure copper, and I do not believe we shall get it cut so as to raise it in ten days. There is twice as much mass copper about that part of the mine as I had ever anticipated. The lode is double the width we had believed it was until very lately."

Another letter says:—

"In the Hill Mine there are at present two masses of pure copper, each exposed more than twenty feet in depth, and are from six to thirty inches thick. Their length is unknown. In the Copper Fall Mine, there is a vein two and a half feet wide, one large mass, and the entire vein thoroughly filled with the native copper."

THE NATIONAL MINING COMPANY.—This company commenced work last year at about 1000 feet distant from the Minnesota Company. They had on hand in the spring thirty tons of copper. A letter from the treasurer in April, says:—

"One mass of three or four tons has been cut in four pieces, one of which weighing 1,600 lbs., is four feet long by two and a half broad, and averages six inches in thickness."

The North American promises to equal the Cliff Mine.

The Northwestern is producing more mass copper than at any previous time. The other companies are reported very favorably.

MARYLAND COPPER.

The mine of the Dally-Hide Copper Co. is in Frederick co., Maryland, less than a mile east of Liberty town, and about nine miles from Monrovia on the Baltimore and Ohio Railroad. The company own in fee simple about 300 acres of mineral lands, and the right to 80 acres more. Several rich and very extensive veins of copper traverse this property, one of which has been worked for several years by a capitalist in Baltimore; but the main, and most important vein now worked, was discovered five months since. It has been opened on the surface to the extent of 800 feet, and at depths of from 25 to 45 feet.

NORTH CAROLINA COPPER MINES.

Prof. C. N. Shepard, recently returned from an exploration in the counties of Mecklenburg, Union, Cabarrus and Rowan, N. C., states that the prospect of an abundant supply of copper ore is afforded by the indications presented in the mines of those counties. The great metalliferous region known as the Gold Hill, in Rowan, is, perhaps, the most promising repository for copper thus far brought to light. Other places may hereafter prove equally rich: but the gold veins at Gold Hill, being already worked to a depth of nearly 350 feet, afford the most favorable opportunity in the country for judging of the character of that spot for copper—a metal which rarely shows itself in much richness at the top of the ground. The professor, while in Charlotte, received the present of a diamond from Dr. Leventhorpe. That gentleman had lately discovered it on his estate at Pioneer Mills, and this is the second specimen of this precious gem found within the year in the county. Hitherto, no special search has been made for the diamond, these specimens having been discovered in a manner purely accidental.

A valuable copper mine has been discovered in Randolph county, N. C. It is said it was worked for gold twenty years ago, and was abandoned. The vein lies between a granite formation, and the copper is found imbedded in the quartz, from four to five feet from the surface. Huge masses of quartz are dug out from this pit, and when the sledge hammer is applied to them, they burst open and expose the copper in seams often entirely across the white quartz.—*Register.*

COPPER MINING IN EAST TENNESSEE.

The mines are located in lat. 35½° north, and 7° west of Washington, and only 4° west of Charleston, S. C. Upon the completion of the Blue Ridge Road, ore can be transported to Charleston for not more than $8 per ton. Some attempts have been made to open the mines, with favorable results.

COPPER IN JAMAICA, W. I.

The reports from the mountain districts in which indications of copper have as yet been traced, continue to hold out the most flattering prospects, and there can be no longer any doubt that nothing but capital and labor are necessary to render this island one of the richest copper producing countries in the world.
Colonial Standard.

The Copper-Rolling Mill at the Washington Navy Yard is now in full operation, and works admirably. It is under the superintendence of the chief engineer and machinist of the yard, who designed the machinery, &c., and under whose superintendence and direction it was constructed. All the old copper, including scraps, is sent to this point from the various navy yards throughout the country, for the purpose of being manufactured into sheets for sheathing, braziers' and boiler copper, and also into various sizes of round bolts, instead of being sold as heretofore to private individuals, and thus an immense saving is effected to the General Government in this manufacture alone.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SILVER MINES IN SOUTH AMERICA.

No just conception can be formed without lengthy exploration of the abundance of silver mines in South America. Generally the ore is as abundant as ever, but the working of a large number of mines has ceased in consequence of the imperfection of machinery, particularly pumps. Lieut. Gibbon, who was sent out to explore the Amazon from its source to its mouth, reports that he has a list of 10,000 abandoned silver mines in that country, many of them upon that water shed. The silver ore has been taken from the veins until the miners reached the water, and then, for the want of the means of drainage, most of these mines have been abandoned.

The machinery heretofore used in the drainage of those mines was only such as could be transported on the backs of mules from the seashore across the Andes.

SILVER MINING IN SPAIN.

Spain was for a great length of time considered richer in silver than any other country in the world. The Phœnicians found so much silver there, that their ships could not bring it all away, so that they even made their anchors of that metal. But more certain than these traditions, is the fact, that the Carthaginians brought great quantities from thence. Under Hannibal the silver mines of Andalusia were worked in a scientific manner, and out of the same he defrayed the expenses of the war which he made at that time against ths Romans. Long after the Romans had taken possession of the land and mines, the old workings were called Hannibal's Shafts. Cato deposited in one year 25,000 lbs. of silver in the Roman treasury. And in the first nine years after the Romans, in the second Punic war, had driven the Carthaginians out of Spain, 111,542 lbs. of silver were taken to Rome. In the time of the Romans, the greatest quantity of silver was found in Andalusia by Hipo and Lisapon. The silver mines by Carthagena were, according to Polybius, the most extensive in Spain; the Romans employed 40,000 people at this place daily. But the silver mines of Spain, in earlier times, were not confined alone to the Sierra Morena; silver was also found in the middle and southern provinces, in the mountains of Toledo, Granada, and Asturia.

Concerning the mines worked by the Goths and Saracens, after the time of the Romans, nothing is known. First of all, in the year 1571, the old Carthaginian silver mine, at Guadacanal, on the borders of the provinces Sevila and Cordova, was reopened by the Earl Fugger, who took it on a lease for 36 years, and it produced so much silver that the royalty of one-fifth amounted in some years, to more than a million and a half of dollars, if these accounts are not, as is probable, very much exaggerated. As the lease expired, this mine was again abandoned, and it is said to have been purposely laid under water. Since then, all efforts to unwater it have proved fruitless; though some years ago exertions were made to bring, not only this but also the mines at Cezalla, into working order; this is nearly all that has been done, owing to the sloth and broken spirits of the inhabitants, to bring its buried riches to light, and place it on a footing with its competitors.

ANCRAM SILVER LEAD MINE.

We have received a copy of the Report of Major Farrington respecting a mine in Columbia county, New-York, called the Ancram Silver Lead Mine

It is located at Curtisville, Ancram township, near the base of hills ranging northeasterly and southwesterly. The report states these facts:—

The formation of this range of hills appears to be mostly composed of slate rocks, interspersed with quartz veins and silurian limestone, containing fluor spar, and nodules of flint or hornstone; directly at the mine, the slate seems to underlie the limestone.

The vein is first observable on the southerly side of the hill, about forty feet above the level of the mill stream that runs at its base, and its strike is nearly south, seventy degrees west; having a more elevated outcropping westerly. An open excavation was made at this place many years ago, about sixty feet in extent along the course of the vein, and to an average depth of fifty feet—the lode to this depth had an average width of two to three and a half feet. A well or pit has been sunk some thirty feet deeper than the other parts, being now seventy-nine feet from the platform at the surface.

From the best information of previous workings of this mine, at least three hundred and seventy tons of dressed ore has been smelted from it; by measurement about seventy fathoms of the vein has been removed, and must consequently have yielded an average thickness of six inches of lead ore.

The excavation shows that no systematic plan of mining has been pursued; the miners appear to have worked in such directions and places as appeared to them most likely to insure ore. They were often misled by strings of ore and small segregated masses as usually exist near the surface of metalliferous lodes. A division of the vein occurs about twenty-five feet below the surface, and makes two veins of about equal width and richness. The gangue of the lode is quarry, and calcareous spar limestone, one each side; about sixty feet northwest of the vein the junction of the limestone with the slate is found, the slate having a dip of two and a half degrees to the south or southeast; the vein appears to have a conformable dip as the shaft which commenced upon the vein at the surface crosses its foot wall at the depth of seventy-two feet.

The result of examination leads to the conclusion that there is a true and persistent vein of lead ore at this place. That it will enlarge and prove richer as we descend upon it—that in six months time it can be placed in condition to receive a large force of miners, whose labor can be directed to the vein.

State Assayer's Office, Boston, Feb. 12, 1853.

To the President of the Ancram Silver Lead Co.

I have assayed the two samples of lead ore from the Ancram mines, and have obtained the following results:

No. 1, granular galena (steel grain ore); one thousand grains of this ore yielded 319.4 of metallic lead, which after re-melting, weighed 319 grains. This 319 grains of lead cupelled yielded 0.25 grains of pure silver, which is equal to 1,564 pounds per ton of 2,000 lbs., or 25 oz. 63-100 of silver per ton of the lead. This silver is worth 1.30 per oz., and hence will come to \$32½ per ton.

Sample No. 2, crystallized lead ore, yielded, in 1000 grains, 633½ grains of metallic lead; 590.7 grains of this lead on cupellation gave 0.45 grains of pure silver, or 1,506 pounds per ton, or 24 9-100 oz. of silver per ton of lead worth \$31 32-100.

Estimating lead at 5 cents per lb., sample No. 1 yielding 319 lbs. per 1000 or 638 pounds per ton.

This ore for lead is worth per ton of ore	\$31 90
And the silver is worth	32 50
Per ton in all	\$64 40

Sample No. 2, yielding 633½ pounds of lead per 1000 or 1,267 pounds per ton of ore.

The lead in a ton of ore is worth	\$63 35
And the silver is worth	31 32
Total	\$94 67

In the above estimates, espenses of mining, smelting, and cupelling have not been considered, as I do not know what they will amount to, nor how much ore will be raised from the mines per day, nor what will be its average yield. You can obtain these data only by practical operation in the business.

Respectfully your obedient servant,
CHARLES T. JACKSON,
Assayer to State of Massachusetts and City of Boston.

Assay of lead ore for Ancram, silver, lead, &c., coarse grain yield, 74¼ per cent. lead, 30 6-20 oz. fine silver per ton of pig lead. Fine grain yield, 40½ per cent. of lead, 16 6-20 fine silver per ton of pig lead.

PLATT & BROTHER,
Per Abel N. Waters.

ULSTER LEAD MINE.

At this mine located in Ulster county, New-York, there are two Scotch hearth furnaces, in working condition, provided with blowing apparatus of the most thorough construction. One furnace only is used, and this for two shifts of eight hours each. Letters say that

"The production is about three pigs per hour, of 75 pounds weight each. Forty pigs per day is the most actually melted. As fast as the melters can be increased by instructing new men, the furnace will be run twenty-four hours, and the other one be put in blast. The actual results so far are 3000 lbs of lead per day."

A letter from the mine of June 7th, says, that the vein at present is over four feet in thickness, pure lead (galena). The vein in the slopes over the cavern varies from 10 to 16 inches in thickness. The vein in the inside slopes, on the large bunch of ore, is about three feet thick, yielding a fine lot of lead. Shaft No. 1, is about the same as when last reported. The boat to take off the lead will be here some time to-day. I expect to have about 325 pigs to ship.

We notice preparations, says the Editor of the Ellenville Journal, for taking out a mass of lead ore, three feet square, which we understand is intended to be placed on exhibition at the World's Fair this season. It will certainly be worth looking at, and not easily handled, as it will weigh something over 7 tons.

SHIPMENTS OF LEAD FROM THE NORTHWEST.

April, 1853.—Shipped from Galena, pigs	51,028
Shipped from Cassville, Buena Vista, Potosi, and Dubuque .	17,692
Pigs	68,720
Shipped same time in 1852	38,897
Increase for 1853	29,823

GREAT NORTHERN LEAD COMPANY.

The mines of this company are located in St. Lawrence county, New-York. The lead which they yield is abundant, and of excellent quality. We have before us the Report of the present mining agent of the company, Mr. John Dunkin, which as it is brief, and evidently careful in its statements, we place entire in the pages of the *Mining Magazine*:—

TO THE TRUSTEES OF THE GREAT NORTHERN LEAD COMPANY:

Gentlemen—Agreeably to the request of yours, at a meeting convened in New-York, on the 19th ult., after a careful examination of the mines of the company, I beg to lay before you this, my report, on their present state and future prospects.

At Coal Hill Mine, I find all the lode taken away for nearly 500 feet long, and 180 feet in depth in the eastern, and 200 feet in depth in the western section, and at an average width of 3½ feet, from whence very large quantities of ore must have been taken.

In Forsyth's Shaft, sinking under the bottom of the old mine, the lode is four feet wide, worth $30 per fathom. In Crystal Shaft, sinking under the eastern section, the lode is three feet wide, producing good stones of lead, with a very promising appearance. In the western section, we are stoping down a piece of ground, preparatory to the sinking of Rodda's Shaft; the lode is four feet wide, worth $70 per fathom. The lode in the bottom of the western section is four feet wide, worth $100 per fathom. In the Ten Fathom Level, driving west of Sampson's Shaft, the lode is two feet wide, producing good stones of lead. In the Adit Level, driving west of Sampson's Shaft, the lode is one foot wide, producing good stones of lead, with every prospect of a steady improvement. At the surface, I have put four men to stope down a side branch to the main lode; it is one foot wide, worth $100 per fathom. I am inclined to think that this will make a distinct lode; and should this be the case, it will a valuable auxiliary, as it can be taken away at a very small expense.

The work I propose doing is, to sink Forsyth's, Crystal, and Rodda's Shafts ten fathoms below the bottom of the present mine, and to drive the levels so as to communicate with the three shafts, when there will be, according to present appearances, some very valuable ground to be taken away, that will, in all probability, pay dividends to the stockholders. But to do the above work and bring the mine into a proper state, it will require $15,000, which I do not hesitate to recommend to be laid out; for such chances of success are rarely to be met with, either in this or any other country.

Taking into consideration the large amount of lead taken out by the former workers—the very fine appearance, the uniform size, and the highly mineralized character of the lode, as it now presents itself, without any perceptible alteration in the stratum, or any other circumstance that would lead any practical miner to conclude to the contrary, there is no reason why it may not be as productive below, as it has ever been above, the present bottom.

We have employed in this mine 28 miners, and eight laborers, under ground; and 21 tradesmen and laborers at the surface. The machinery is in a very efficient state, and calculated to put the mine to a considerable depth below the present bottom.

Union Mine.—In Collins's Shaft, sinking under the Sixteen Fathom Level, the lode is five feet wide, worth $50 per fathom. The lode in the Sixteen Fathom Level, west of Collins's Shaft, is three feet wide, producing good stones of lead; but it is throwing out so much water that we are obliged to suspend it until we communicate with the Victoria Shaft. In the Sixteen Fathom Level, east of Collins's Shaft, the lode is two feet wide, with stones of lead. We have about six feet to drive, to communicate with Victoria Shaft. In the stope in the back of the Sixteen Fathom Level, East of Collins's Shaft, the lode is five feet wide, worth $100 per fathom. In the Sixteen Fathom Level, west of Victoria Shaft, the lode is two feet wide, producing good stones of lead. The lode in Victoria Shaft is 4½ feet wide—a very fine-looking lode, producing good stones of lead. In the Sixteen Fathom Level, east of Victoria Shaft, the lode is five feet wide, with a most splendid appearance, and worth $100 per fathom.

We have at present fourteen miners and three laborers employed at this mine under ground; and seven tradesmen and laborers at the surface.

For the proper working of this mine, I would recommend the immediate erection of a steam engine for draining it of water; and to it may be attached a crusher, for the crushing of the ore, of which I have no doubt, in sinking the shafts, driving the levels, and stoping the backs, there will be an abundant supply. If the lode had been destitute of mineral, its size and character would be quite enough for me to give such a recommendation.

The houses of the company are in a good state of repair, and capable of accommodating most of the men required to carry on the mines.

I congratulate the stockholders on their being in the possession of such valuable property, which, if judiciously and economically managed, cannot fail to be highly lucrative for the capital laid out on it.

Should any of the trustees or stockholders be coming this way, I should be very happy to give them an opportunity to judge for themselves; or, should be very glad if any of them would send some efficient and respectable mine agent to inspect the mines, and report on them for their own satisfaction.

I am, gentlemen, your ob't servant,

JOHN DUNKIN.

Great Northern Lead Mines, Rossie, May 18, 1853.

SOUTHAMPTON MINES IN MASSACHUSETTS.

The present operations at these mines are described in a few words by the editor of the *Northampton Gazette*, who is located a few miles from them:—

Day and night, three sets of hands—eight hours each—are pushing inward the old drift, in spite of the almost invincible hardness of the pre-adamitic rock. A thousand feet horizontal excavation into the rocky hill, has within the last three months become a thousand and thirty—the work advancing about nine feet a month. Fifty feet or more yet remain before reaching the vein.

The drift is ventilated by means of a large wooden pipe which goes to the head of the drift, drawing off the unwholesome air, for several hundred feet horizontally, and then upward through a perpendicular shaft, at the top of which a stovepipe leads into an adjoining stove. A fire in this stove kept constantly, quickens the current, so that the noxious vapor escapes through the stove, and the pipe which leads from it. If any one in this busy world has time for excursions in pursuit of novelties, we advise him or *her* to take a step in this direction. You can walk into the long hole, or creep in, or be trundled in, just as you like, and you can have a salute from the powder of the mines, which will fill your ears no doubt. Just go and see!

SILVER MINES IN NEW MEXICO.

Little is known in this country respecting the present condition of the Mines and mineral resources in New Mexico. A letter to Hunt's Merchants' Magazine gives some brief details of the silver mines discovered in that Territory and the efforts at present made to work them; from it we have taken the following interesting particulars:

The silver mines which have been discovered in this Territory are in the Orgonos range of mountains, Dona Ana county. The mine now being worked is about ten miles east of Dona Ana (latitude 32° 22′), on the western slope of the mountain. This vein is known to extend south not less than six miles, and, as it now appears, is from one to four feet wide, and has a dip of about 20° east. The character of the ore is argentiferous galena and limestone, 100 pounds of which yielded, from first assays, about ten pounds of pure lead, and not less than three ounces of pure silver; it now yields about four ounces of silver from 100 pounds of ore; the vein becomes richer as the shaft is sunk. About ten tons of the ore have been smelted, with a common blacksmith's bellows, and give the above-stated results. A small reverberatory furnace has recently been erected, and about a ton of the metal smelted by that process, and has proved highly satisfactory.

Unfortunately for those who may wish to engage in working these mines, there is no one in this part of the country who fully understands the silver mining and smelting business. The person who has charge of this mine has obtained what little knowledge he possesses, by being employed in a subordinate capacity, at the Corralettas Mines, in the State of Chihuahua.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE OF THE UNITED STATES.

The following Table, prepared by BENJ. BANNAN, *Esq., the Editor of the Miner's Journal, exhibits the quantity of Anthracite Coal sent to market from the different Regions in Pennsylvania, from the commencement of the Trade in 1820 to 1852, inclusive; together with the Annual Increase, &c.; and the importations of Foreign Bituminous Coal.*

Y'RS	SCHUYLKILL. Canal.	SCHUYLKILL. Railroad.	SCHUYLKILL. Total.	SCHUYLKILL. Pine-Grove.	SCHUYLKILL. Little Sc'kill.	LEHIGH. Total.	OTHER REGIONS. Lacka-wana.	OTHER REGIONS. Wilkes-barre.	OTHER REGIONS. Shamo-kin.	OTHER REGIONS. Lykens Valley.	OTHER REGIONS. Dauph'n Co.	Aggre-gate.	Annual Incr'se.	Con-sump-tion.	Sold on line of Sc'kill.	Import of For-eign Coal.
1820						365						365				
1821						1,073						1,073				99,129
1822						2,240						2,240				84,523
1823						5,823						5,823				80,488
1824						9,541						9,541				7,228
1825	6,500		6,500			28,393						34,893	26,854			35,645
1826	16,767		16,767			31,280						48,047	13,154			35,665
1827	31,360		31,360			32,074						63,434	15,387			40,257
1828	47,284		47,284			30,232						77,516	14,082		8,154	32,302
1829	79,973		79,973			25,110	7,000					112,083	34,567		3,252	45,393
1830	89,984		89,984			41,750	43,000					174,734	62,651		5,321	55,186
1831	81,854		81,854			40,966	54,000					176,820	2,036	177,000	6,150	36,509
1832	209,271		209,271		14,000	70,000	84,600					363,871	187,051	298,871	10,048	72,978
1833	252,971		252,971		40,000	123,000	111,777					487,745	123,877	484,986	13,422	92,432
1834	226,692		226,692		34,000	106,244	43,700					376,636	decrease	415,190	19,429	71,626
1835	339,508		339,508		41,000	131,250	90,000					560,758	184,122	685,985	18,571	49,969
1836	432,045		432,045		35,000	148,211	103,861					682,428	121,670	633,428	17,863	108,432
1837	523,152		523,152	17,000	31,000	223,902	115,387					881,476	199,048	880,441	21,749	153,450
1838	433,875		433,875	13,000	13,000	213,615	76,207					739,293	decrease	788,968	28,775	129,083
1839	442,608		442,608	20,639	9,000	221,025	122,300		11,930			819,327	80,034	867,000	30,890	181,551
1840	452,291		452,291	23,860	20,000	225,318	148,470		15,505			865,414	46,087	973,186	28,994	162,867
1841	584,692	850	584,692	17,653	40,000	143,037	192,270		21,463			958,899	93,485	958,899	41,228	135,894
1842	491,602	49,902	540,892	32,381	37,000	272,546	205,253	47,346	10,000			1,108,001	149,102	1,156,001	40,584	141,521
1843	447,058	230,254	677,295	22,905	31,000	267,793	227,605	58,000	10,000			1,263,539	155,538	1,261,539	34,619	41,163
1844	398,887	441,491	839,934	34,916	57,000	377,002	251,005	114,906	13,087			1,631,669	368,130	1,631,669	60,000	87,073
1845	263,587	820,237	1,083,796	47,928	74,000	429,453	273,435	178,401	10,000			2,023,052	391,383	2,023,052	90,000	58,775
1846	8,440	1,233,142	1,237,002	58,926	91,000	523,662	320,000	192,598	12,572			2,343,992	320,940	2,343,992	155,460	156,855
1847	222,693	1,360,681	1,583,374	67,457	106,401	643,973	388,203	284,893	14,904			2,982,309	638,317	2,752,309	226,610	148,021
1848	436,602	1,216,233	1,652,835	61,000	162,636	680,746	437,500	237,271	19,356			3,089,238	106,929	2,839,238	252,837	196,168
1849	459,208	1,115,918	1,605,126	73,299	174,756	801,946	454,240	259,080	19,650	25,825		3,242,866	153,408	3,195,000	239,290	198,213
1850	288,680	1,423,977	1,712,007	70,919	211,960	722,622	550,417	248,950	19,981	37,768		3,350,840	114,093	4,193,725	207,863	180,439
1851	579,156	1,650,270	2,184,240	none.	310,307	989,296	795,095	386,000	94,899	54,900	30,000	4,338,780	1,026,831	4,788,589	312,867	
1852	800,033	1,650,912	2,452,950	66,548	325,099	1,114,026	923,209	320,000	25,846	59,857	28,669	4,896,180	544,514		322,211	
	8,670,656	11,186,022	19,856,978	536,956	1,536,151	5,678,054	6,017,654	2,271,784	219,188	176,295	58,669	37,860,965				

INCORPORATED COMPANIES.

Every incorporated coal mining company in Schuylkill County, Pennsylvania, has been compelled to cease mining as a company, and have been driven out of the business by individual enterprise.—*Miners' Journal.*

COAL TRADE OF RICHMOND.

The following is the quantity of coal shipped from Richmond, the terminus of the Philadelphia and Reading road, in the years 1850, 1851 and 1852, together with the number of vessels:

	Tons.	Vessels.
In 1850,	1,975,344	7,549
" 1851,	1,211,605	8,623
" 1852,	1,236,649	9,047

Increase in 1852, 25,044 tons.

LEHIGH COAL TRADE.

The last annual report of the Lehigh Coal Company says the estimate made of the amount of coal to be transported in 1852, was eleven hundred thousand tons.

Total quantity of coal shipped, ... tons 1,114,281
Increase in 1852, 124,581 tons.

The distribution of the above was as follows:—

	Tons.
Consumed on the line of the Lehigh Canal,	151,654
Passed into the Morris Canal,	180,189
Entered the Delaware division of the Pennsylvania Canal,	782,388

The shipments of lumber for the year amounted to 52,123,751 feet—being an increase of more than 12,000,000 feet over the shipments of the previous year. The total freight transported on the Lehigh Canal for 1852 was 1,320,653 tons.

The profits of the year were, from ground and water rents and from lots sold, $33,381 46; from coal, $202,562 86; from tolls, $486,555 14; making an aggregate of $722,999 46; showing an excess in each one of these items over the corresponding items for 1852, and a total increase of $77,788 96 over the corresponding aggregate for the previous year. The balance for the year to the credit of profit and loss, after providing for interest, expenses and repairs, ordinary and extraordinary, was $220,871 01; exhibiting an excess of $149,706 73 over the balance for the preceding year. During the year the increase in the capital stock was $66,250; decrease in the funded debt, $62,908 74; decrease in the floating debt, $223,900 29; decrease in the general indebtedness of the company, $308,056 53. The assets included, at the close of the year 1852, $379,592 09 of the company's loans, held in trust as a contingent fund, subject to the orders of the Board of Managers.

On the first day of January last, the entire amount of the company's liabilities, including the capital stock, loans, and obligations of every kind, was $7,296,538 81. Since the close of the year 1852 the capital stock has been further enlarged to $1,983,900, the amount at which it now stands. The funded debt has been reduced from $5,283,169 12 to $4,888,895 89. The contingent fund has been augmented to $424,998 09. The estimate for the present season is given at 1,225,000 tons, or an increase of about ten per cent. Much the larger proportion of this production has already been sold at satisfactory prices, and for the balance, a market will, without doubt, be readily found.

ANTHRACITE COAL TRADE FOR 1853, BY READING RAILROAD.

Amount of coal forwarded by railroad during the week ending June the 2d, 1853, and since December 1st, 1852.

	Tons.
From Schuylkill Haven,	14,774 08
" Pottsville,	1,415 04
" Port Carbon,	12,101 04
" Port Clinton,	6,778 02
Total the week,	36,068 18
Total since Dec. 1st.	595,800 05
Same time last year,	568,223 05

BY SCHUYLKILL CANAL.

Amount of coal transported on the Schuylkill Canal during the week ending Thursday, June 2d, 1853:—

	Tons.
From Port Carbon,	9,795 00
Pottsville,	1,815 19
Schuylkill Haven,	9,692 16
Port Clinton,	2,071 12
Total this week,	22,375 07
Total this year,	216,761 03

LEHIGH REGION.

The shipment of coal sent to market from the Lehigh region during the week ending the 31st ult., and since the opening of the navigation, has been as follows:—

	The Week.	Total.
By Lehigh,	tons 15,247 01,	89,462 09
" Room Run,	2,814 06	14,683 00
" Beaver Meadow,	1,535 01	9,325 09
" Spring Mountain,	4,374 16	24,026 00
" Hazleton,	4,742 00	24,228 00
" Buck Mountain,	2,186 13	15,089 12
" Cranberry,	1,905 00	7,992 00
" Colerain,	1,850 03	11,390 00
" East Sugar Loaf,	1,083 17	4,831 11
" Diamond,	1,421 00	8,662 00
" White Haven,	1,006 13	4,102 10
Total this year,	38,167 11	213,812 11
Total last year,	35,027 11	233,111 09
Same time year before,	31,918 17	246,503 04

COLLIERIES AND COAL OPERATORS.

The increase in the number of collieries and coal operators during 1852 as compared with 1851 was, according to the *Miners' Journal*, as follows on the 1st of January, 1853.

	Above wat. level.	Below do.	Total.	Operators.
W. Branch,	32	18	50	25
S. Valley,	18	16	34	26
Mill Creek,	11	6	17	14
Mt. Carbon,	7	8	15	10
Tamaqua,	10	4	14	9
Tremont and Donaldson,	6	0	6	6
Lorberry Creek,	2	0	2	2
	86	52	138	92
In 1851,	78	39	120	91

It appears, by the above table, that while the number of collieries are increasing, the number of operators do not increase in the same ratio. This is caused by the greatly increased expense in preparing collieries for a profitable business, particularly below the water level.

Receipts of Coal at Baltimore for the past Eight Years, to the 1st of January.

	Cumberland.	Anthracite.
1845	16,000 tons	90,000 tons.
1846	18,393 "	100,000 "
1847	50,259 "	110,000 "
1848	60,289 "	125,000 "
1849	71,699 "	140,000 "
1850	146,645 "	160,000 "
1851	163,855 "	200,000 "
1852	256,000 "	125,000 "

CUMBERLAND COAL TRADE.

The whole trade by railroad and canal in 1851 was as follows:—

By railroad,	148,297 tons.
By canal,	85,719 "
	234,016 tons.
Consumed by the railroad company in 1851,	19,549 "

The amount of Cumberland coal sent from the Cumberland coal region during the week ending May 28, 1853, was the largest ever sent from that region in a week, by the canal. The entire amount sent was, by railroad, 5,917 tons, by canal, 5,210 tons; total for the week, 11,127 tons, against 10,270 for the week previous. Amount for year by railroad, 94,978 tons; by canal, 51,673 tons. Total for the year, 146,651.

SCRANTON COAL REGION.

Scranton, in Luzerne county, Pennsylvania, is the location of vast quantities of the best white ash coal. Measures are in progress to open a route by which it is intended to bring this coal directly to New-York city, at a less expense for freight than is paid on the coal brought to Philadelphia from their present routes. The railroad for the purpose is to be of the wide gauge. Such a road is already in operation from Scranton to Great Bend, where it connects with the New-York and Erie. The location of the road from Scranton to the Water Gap, is confidently believed by its friends to be the only practicable, direct route from the great anthracite coal fields of the Lackawanna and Wyoing Valleys to New-York. The New Jersey Central Railroad Company, whose road runs directly from New-York to Easton, Pa., allude to the same subject in their recent report. They say:—

The Lehigh Valley Railroad, which will open the Lehigh valley to south Easton, will be finished in 1854, bringing that coal and iron region in direct communication with New-York. The Catawissa Railroad to connect with the Sunbury and Erie Railroad, is also in a forward state, and legislation has been obtained for a connection with Pittsburg and the Pennsylvania Central Railroad Co. over the road of the Dauphin Coal Co. The Warren Railroad, a charter for which was granted in 1851, connecting the N. J. Central Railroad at New Hampton, with Scranton, in Pennsylvania, and thence through other roads to Lake Ontario, is already surveyed and located, and will be completed in the fall of 1854. This will be of great importance in connection with the Lackawanna coal and the western trade.

COAL OF WESTERN PENNSYLVANIA.

Professor Hall, the State geologist, who has been engaged for some time past in making a thorough examination of the bituminous coal field in the town of Lafayette, McKean county, Pa., is about to make out a report in detail of his

labors and the results. Mr. Hall states that the field which he examined contains about six thousand acres, all of which contain coal; that at least three-fourths of the tract has an average of eight feet in thickness, which is more easily approached by railroad than almost any other field within his knowledge. The quality of the coal is equal to that of any bituminous coal found either in Ohio or Pennsylvania, a good portion being superior cannel coal, and in quantity sufficient for all the wants of western New-York for the next one hundred years at least. In addition to this, the country immediately beyond the Kenzue, and but a few miles south of this field, and directly on the line of the Alleghany Valley Railroad, is full of coal of a similar quality, together with large beds of iron ore.

He also found the field which he examined underlaid by a thick stratum of sandstone, of superior quality for the manufacture of glass. He found also between the strata of coal a thick vein of fine clay, which is of a very superior quality.—*Buffalo Courier.*

COALS IN ENGLAND.

The total production of coal in Great Britain, in 1850, was 34,000,000 tons, of which 2,785,300 tons were exported chiefly to France and northern Europe. The Lancashire coal-field produces annually 4,000,000 tons. The coal brought into London, and consumed there, in 1850, was 3,637,878 tons. The coal brought into Liverpool, during the same time, was 1,400,000 tons, of which 180,000 tons were exported—leaving 1,220,000 tons as the consumption of that city alone. The consumption in Manchester, during 1850, was 1,230,000 tons; in Preston, 410,000 tons; in Glasgow, 1,650,000 tons; in the surrounding neighborhoods of Lanark, Renfrew, and Ayrshire, 3,000,000 tons, and in the iron districts of South Wales, 4,000,000 tons.

IRON AND ZINC.

IRON, THE METHOD OF MANUFACTURE.

As many of the readers of the Mining Magazine may be uninformed respecting the process of making iron from the ore, we present them with the following comprehensive summary of the English method, which has been prepared with much clearness and simplicity:

The general process of making iron we may describe; the materials for the make of iron are three.—1st. The ore, of which the leading ores are called silicious or argillaceous, according as silex, lime, or clay predominates in them The English Staffordshire ores contain about 30 per cent. of metal, and those of Wales 33 per cent., in Pennsylvania 30 per cent. 2d. The fuel—this must be accommodated to the chemical nature of the ore, which is a metallic oxide, hence must be exposed to some agent that will drive off the oxide in order to free the metal. This must be effected by the use of carbon; hence charcoal is the superior fuel. It is, however, expensive, and the English miners prepare fuel by "cokeing." Thus the basis of coal is carbon, but it contains a quantity of bituminous matter, sulphur, tar, hydrogen gas, and moisture, on being deprived of which it becomes a tolerably pure carbon, and is called "coke." This is effected by baking it in an oven, by which it loses about 35 per cent. of weight. In the United States wood is yet so abundant, that charcoal may for a long time be used, when its cost will forbid its application to the iron manufacture in Europe. In fact, so far back as Elizabeth and James, the iron works were occasionally suppressed, because of the wood they used, and the English manufacturer struggled against that difficulty until within the last 100 years, since when coke has come into use. This fact being known to the English old iron dealers, causes them to seek after the iron in old buildings

The anthracite coal of Pennsylvania has been successfully applied to the manufacture of iron within the last ten years, and, of good quality, is now admitted to be the most perfect of all fuels for the manufacture of iron. 3d. The flux, the business of which is to combine with earthy matter of the ore as the fuel combines with the oxygen, and the nature of the ore therefore indicates the necessary flux; silicious ore requires an argillaceous flux, and argillaceous ores a calcarious flux. The preparation of the flux is mechanical only. It requires to be broken into convenient lumps, and arranged with the fuel and ore, which has also been roasted, in order to drive off the sulphur, water, arsenic, and other volatile substances. The blast furnace is a pyramid of 45 to 50 feet high, say 50 feet square at the base, and 30 at the top. The interior is shaped like a double cone, something like a sugar-loaf placed on a funnel; at the bottom are arched recesses, one of which is for drawing out the metal, and the others to admit the blast which maintains the fire; at the top of the tunnel is a platform, tended by a filler, a careful person, whose business it is to regulate the charge according to the kind of iron required: an ordinary charge consists of 6 cwt. fuel, 6 cwt. of ore, and 2 cwt. of flux. These are measured upon the platform, and 50 such charges are turned into the furnace in 12 hours, keeping it always full. The combined operation of the fuel in combustion, and the flux, is to detach the iron, which settles in a fluid state at the bottom of the furnace, in front of which is a thick bed of sand, forming the floor of the casting house. In this sand the moulder forms a main trench, which is called a "sow," leading from it are a number of side trenches, called "pigs." Twice in twenty-four hours the blast of the furnace is cut off, and the bottom tapped, when the molten iron flows forth, foaming and sparkling with a dazzling brilliancy, into the "sow," thence into the "pigs," each of which contains about 100 pounds, when cold. The whole weight of iron thus drawn forth is about 6 tons, as the product of about 35 tons of material. The quantity of carbon which the pig metal contains determines the quality; that element confers softness, toughness, and fusibility upon it.

The next process for the iron is the "refinery," which is a broad shallow hearth, open in front; above is a low chimney. In this furnace is placed a charge of fuel and pig iron. Two blasts are set in action for two or three hours, upon the fused metal upon the hearth, the carbon of which combines with the oxygen of the blast. The metal then flows into a broad shallow trough, where, cooled in water, it becomes "finer's metal," and ready for "puddling." Here the metal does not come in contact with the fuel, but the heat is raised until the metal becomes sticky. The heat is then lowered, and the metal becomes almost like powder, emitting a vapor. The heat is then again raised, and the puddler, with a long bar, kneads the metal into a ball of 80 to 90 pounds weight. This ball is then dragged under the "hammer," a gigantic instrument of some five tons weight, worked at the rate of one hundred blows per minute, by a steam engine. By this process the "puddle ball" is condensed into a "bloom," which is malleable iron of tolerable purity. It is conveyed, still hot, to the "rolling mill," which is composed of two cast-iron rollers running contrary ways. They are case-hardened, and turned in a lathe. These are set in motion by steam, and a man, taking up one end of the bloom, applies it to the rollers, which drag it in and thrust it out on the other side, considerably elongated.

A boy then turns it back over the upper roller to the man, who again thrusts it through a smaller opening of the rollers. After several repetitions, the "bloom" has become a bar fifteen feet long, called "No. 1, bar-iron." It is then cut up into short lengths, called "puddle bars," and, still hot, carried to the "balling furnace," where five or six of them are placed flat on each other, and, with a long shovel, thrust into the furnace, until they reach a welding heat. They are then withdrawn and sent to the rollers, whence they issue in the shape of a smooth, well-compressed bar, which, the rough ends being cut off by a circular saw, is placed upon an iron floor and straightened; it is then

"No. 2 bar-iron," or "merchant bars." A repetition of the process cf cutting up, heating, and rolling, improves its strength and malleability, and it is then "No. 3," or "best bar." And in this manner is perfected cable iron, nail, and wire rod, boiler plates, &c. "Scrap iron" is composed of old nails, saucepans, and odds and ends of metal, and it is therefore of the very best quality, and is employed for locomotive axles, and where strength is most required. The waste in the process is such, that one hundred tons ore may yield thirty tons pig and twenty tons best bar.

MANUFACTURE OF SHEET IRON.

A late number of the *London Mining Journal* describes some improvements in the manufacture of sheet iron, which had recently been patented in England:—

The object is to produce it of a quality resembling as nearly as possible the Russian sheet iron; and this is effected by a combination of rolling and hammering processes, in the following order;—a flat plate being first forged from any good iron, and rolled to a convenient thickness, is cut up into pieces called "largets," each weighing about 14 lbs., or of any other convenient weight and size. Each larget is then heated and passed several times between heavy rollers, after which four of them are rolled together between heavy rolls, and any irregular projections cut off. They are then heated separately, and rolled until they are brought to somewhat near their ultimate intended size, about 56 by 28 inches, when they are again heated and rolled, which concludes the first part of the process.

A pile is then made of the rolled plates, which is inclosed by an outer sheet to prevent access of air to the plates, and heated in a furnace up to a cherry red. It is then taken out, and about 20 of the plates are piled together, with powdered charcoal between them, and in this state they are well hammered by a hammer weighing about 250 lbs. After which they are subjected to a second and final hammering. In this case they are piled one hot and one cold alternately to the number of from 40 to 60 in a pile, and the hammer used is a heavier one, weighing about 900 lbs. After this operation, which effects the planishing of the plates, they are annealed in the usual way, and are then ready for the market. Boiler plates and iron plates of inferior quality may be considerably improved in quality by rolling them while hot with powdered charcoal laid between them. The peculiar features of the invention are stated to consist;—1. In manufacturing sheet iron by rolling or hammering the sheets when piled together in a heated state, and with powdered charcoal between the sheets composing the pile. 2. In hammering or rolling sheet iron when laid up in piles composed of hot and cold sheets alternately, for the purpose of planishing the same.

ALLOYS OF IRON FOR RAILROADS.

We copy the following from the *Scientific American.* Whatever can improve the quality of iron must be of interest to the manufacturer. We have seen some excellent iron made by mixing in a puddling furnace a small percentage of New Jersey Franklinite with common pig and scrap iron.

At a recent meeting of the Institution of Mechanical Engineers in Birmingham, England, a very interesting paper was read by J. D. Stirling, on the composition and manufacture of alloys of iron. By introducing one-half per cent. of tin into the puddling furnace along with iron, a quality of iron crystalline, close in texture, and harder than common wrought iron was produced. This iron was very suitable for the wearing surfaces of rails and tires of wheels. It prevents lamination and wears smoothly and evenly. At points and cross-

ings, and for rails upon sharp inclines of railroads, this kind of iron alloy was found to be far superior to any rails ever tried before, it had endured twice as long. It was believed that this superiority of iron was not a result due to its greater hardness, but rather from the peculiar crystalline texture and fine grain of the iron enabling it to resist lamination, which high speeds and heavy engines so rapidly produce. This is certainly useful information for our manufacturers of railroad iron.

The addition of zinc and its oxides produces the opposite effect to tin, as the tin renders the iron more *crystalline*, while the zinc renders it more *fibrous*. Zinc renders cold short iron tough and strong, and a great improvement is effected by the addition of zinc to red short iron. The addition of tin and zinc to iron is made at the time when the iron in the puddling furnace is beginning to boil. At the World's Fair American iron of an excellent quality, made from cold and red short, to which some ore of zinc had been added, was exhibited. Mr. Ducloz, of Belgium, considers that the action of zinc, in improving iron, is not due to being mixed along with iron as an alloy, as zinc is volatile at the boiling point, and he had analyzed some iron, to which zinc had been added in the puddling furnace, but found none in the iron; the zinc had all escaped in a state of gas, and yet a superior iron was made by a mixture of about one-fourth per cent. of zinc. There could be no doubt that this was due to a certain action, not well understood, in the furnace, and not to an alloy formed with the two metals. These remarks respecting alloys of iron, we believe, are worthy of general attention. Cylinders and other machinery may, perhaps, be greatly improved by using alloys of iron.

ZINC.

Zinc Paint.—The advantages claimed for zinc over lead, are its greater cheapness, commercially speaking, white zinc covering (equal quantity) from one third to one half more surface than lead; its superior whiteness, brilliancy, and durability, the zinc resisting the discolorations and corrosions made on lead by coal and sulphur gases, bilge water, &c.; its entire freedom from those poisons which, in lead, generate several dangerous diseases well known to workers in lead, lead painters, tenants of freshly lead-painted rooms, and medical men. The white zinc, as an inside paint, has all the polish and beauty of a porcelain surface, and will retain its brilliant whiteness. The zinc colors (brown and brown-stone color) requiring but little oil, dry suddenly, forming a metallic coating on wood, brick, iron, &c., impervious to weather and salt-water, and nearer fire-proof than any other paint known.

ZINC IN WISCONSIN.

The deposits of zinc ore—the sciliate and sulphuret of zinc—which are so abundant in the State of Wisconsin, and within an easy and convenient distance of Galena, will undoubtedly become, as soon as the numerous railroads projected in that quarter are completed, a source of great wealth to the country. Thousands and thousands of tons of ore, which in England are highly valued, are now lying on the surface of the ground in many portions of the mines, a hindrance to the miner and a pest to the owners of the soil. As soon as this ore and the coal of the great Illinois coal-fields are brought together, the business of the reduction of the former to a valuable mineral, valuable in any market, will commence. For more reasons than one this result is much to be desired. Zinc is daily more and more used in the arts, and ninety-nine hundredths of all now consumed in the country is imported. The successful manufacture of the article at *home*, would add much to the wealth of the country.—*Galena Jeffersonian.*

IRON MANUFACTURES.

We are indebted to the Report of the late Superintendent of the Census to Congress, for complete details of the manufacture of pig and wrought iron and castings in the United States. The following tables contain the details, embracing the number of establishments, capital, ore used, persons employed, value of the products, &c.

Pig Iron.

STATES.	Number of establishments in operation.	Capital invested.	Tons of ore used.	Tons of mineral coal.	Bushels of coke and charcoal.	Value of raw material, fuel, etc.	Number of hands employed.	Wages per month.	Average wages per month.	Tons of pig iron made.	Value of other products.	Value of entire products.
Maine	1	$214,000	2,907		218,970	$14,939	71	$1,569	$22 00	1,484		$56,616
New Hampshire	1	2 000	500		50,000	4,900	10	180	18 00	200		6,000
Vermont	3	62,500	7,678	150	326,437	40,175	100	2,208	22 08	3,200		68,000
Massachusetts	6	469,000	27,909		1,856,000	183,741	268	7,236	27 62	12,287		295,123
Rhode Island												
Connecticut	18	225,600	35,450		2,870,000	289,225	148	3,967	26 80	18,420	$20,000	415,600
New-York	18	605,000	46,885	30	8,000,074	821,027	505	12,625	25 00	28,029	12,800	697,920
New Jersey	10	967,000	51,366	20,865	1,621,000	282,707	600	12,720	21 20	24,031		560,544
Pennsylvania	180	8,570,425	877,288	316,060	27,506,156	3,782,427	9,235	201,069	21 65	285,702	40,000	6,071,518
Delaware												
Maryland	18	1,420,000	99,866	14,068	8,707,500	560,725	1,370	27,595	20 14	48,641	96,000	1,056,400
Virginia	29	518,300	67,819	30,962	1,211,000	158,307	1,115	14,282	12 76	22,163		621,924
North Carolina	2	25,000	900		150,000	27,900	26	208	8 00	400		12,500
South Carolina												
Georgia	3	26,000	5,189		430,000	25,840	185	2,855	17 44	900	25,000	57,800
Florida												
Alabama	8	11,000	1,883		145,000	6,770	40	700	17 50	529	5,000	22,500
Mississippi												
Louisiana												
Texas												
Arkansas												
Tennessee	23	1,021,400	83,910	177,167	160,000	254,900	1,718	21,958	12 81	30,420	41,900	676,100
Kentucky	21	924,700	72,010		4,576,269	260,152	1,845	37,335	20 28	24,245	10,000	604,087
Ohio	35	1,508,000	140,610	21,730	5,428,800	680,087	2,415	59,129	24 48	52,658		1,255,850
Michigan	1	15,000	2,700		135,000	14,000	25	875	35 00	660	6,000	21,000
Indiana	2	72,000	5,200		310,000	24,400	88	2 290	26 00	1,650		58,000
Illinois	2	65,000	5,500		170,000	15,500	150	3,310	22 06	2,700		70,200
Missouri	5	619,000	37,000	55,150		97,367	334	8,112	24 28	12,250		314,500
Iowa												
Wisconsin	1	15,000	3,000		150,000	8,250	60	1,800	30 00	1,000		27,000
California												
District of Columbia												
Total	377	17,346,425	1,579,309	645,942	54,165,236	7,005,289	20,298	421,435		564,755	259,700	12,748,777

Castings.

STATES.	NUMBER OF ESTABLISHMENTS IN OPERATION.	CAPITAL INVESTED.	TONS OF PIG METAL.	TONS OF BLOOMS USED.	TONS OF ORE USED.	TONS OF MINERAL COAL.	BUSHELS OF COKE AND CHARCOAL.	VALUE OF RAW MATERIAL, FUEL, ETC.	NUMBER OF HANDS EMPLOYED.	AVERAGE WAGES PER MONTH.	TONS OF CASTINGS MADE.	VALUE OF OTHER PROD'TS.	VALUE OF ENTIRE PRODUCTS.
Maine	25	$150,100	8,591	945		1,819	14,000	$119,570	943	$29 00	8,601		$365,000
New Hampshire	28	232,700	5,673	500		1,680	90,500	177,060	874	33 05	5,764	$27,700	371,710
Vermont	26	200,720	5,279	274		1,066	196,400	160,608	381	28 97	5,000	87,770	460,581
Massachusetts	68	1,499,050	81,184	3,861		12,401	8,500	1,957,904	1,596	30 90	32,074		3,230,685
Rhode Island	20	428,600	8,918			4,670	4,000	256,267	600	29 68	8,556	119,500	728,705
Connecticut	60	580,600	11,896	387		7,599	30,600	351,369	942	27 02	11,210	70,000	961,400
New-York	323	4,672,488	108,945	3,219		22,755	181,190	2,393,768	5,025	27 49	104,568		5,921,980
New Jersey	45	593,250	10,666	350		5,444	175,600	801,048	908	24 09	10,259		686,430
Pennsylvania	320	3,422,924	69,501	319		49,228	276,855	2,872,467	4,732	27 65	67,810	661,160	5,354,851
Delaware	18	378,500	4,440			4,967		158,852	250	23 88	8,680	55,000	267,462
Maryland	16	359,100	7,220			6,000	80,000	259,190	761	27 50	6,244	50,000	686,000
Virginia	54	471,160	7,114	205		7,579	71,600	297,014	610	19 91	5,577		674,416
North Carolina	5	11,500	192				6,875	8,941	15	23 46	172		19,367
South Carolina	6	155,700	169		2,600		405,560	29,138	158	18 59	1,266		67,658
Georgia	4	85,000	440			100	9,800	11,950	39	27 43	415		46,200
Florida													
Alabama	10	216,625	2,848				31,800	102,085	219	30 05	1,915		271,196
Mississippi	8	100,000	1,197			948	92,000	60,870	112	37 91	924	2,800	117,400
Louisiana	8	255,000	1,660			3,205		75,300	347	35 60	1,570	4,000	312,500
Texas	2	16,000	250			250		8,400	35	43 43	200	15,000	55,000
Arkansas													
Tennessee	16	139,500	1,659		5,050	24,690	18,900	90,085	261	17 96	3,864		264,825
Kentucky	20	502,200	9,731			2,649	482,750	295,598	558	24 69	5,888		744,816
Ohio	188	2,068,650	37,555	1,848	2,000	30,006	255,120	1,199,790	2,705	27 39	37,399	209,700	3,069,350
Michigan	68	195,450	2,494			901	16,200	91,865	337	28 68	2,070	25,616	279,697
Indiana	14	32,200	1,968	5		189	29,600	66,919	149	25 74	1,757		149,480
Illinois	29	260,400	4,818	50		1,412	12,500	172,380	332	35 50	4,160	59,250	441,185
Missouri	6	197,000	5,100	200		2,596		188,114	297	19 63	5,200		396,495
Iowa	8	5,500	81				900	2,594	17	32 85	71	2,600	8,500
Wisconsin	15	116,350	1,871	15		695	2,700	86,090	239	26 73	1,843	64,025	216,195
California	1	5,000	75			25		6,580	8	28 88	75		20,740
District of Columbia	2	14,000	545			80		13,100	27	27 05	512	11,000	41,696
Total	1,391	17,416,361	345,558	11,416	9,650	190,691	2,418,750	10,346,355	23,541		322,745	1,524,121	25,108,155

Wrought Iron.

STATES.	NUMBER OF ESTABLISHMENTS IN OPERATION.	CAPITAL INVESTED.	TONS OF PIG METAL.	TONS OF BLOOMS USED.	TONS OF ORE USED.	TONS OF MINERAL COAL.	BUSHELS OF COKE AND CHARCOAL.	VALUE OF RAW MATERIAL USED.	NUMBER OF HANDS EMPLOYED.	AVERAGE WAGES PER MONTH.	TONS OF WROUGHT IRON MADE.	VALUE OF OTHER PROD'TS.	VALUE OF ENTIRE PRODUCTS.
Maine									6				
New Hampshire	9	$4,000	145				50,000	$5,600	67	$82 00	110		$10,400
Vermont	8	82,700	750	525	2,625		837,000	66,194	260	31 05	2,045		168,966
Massachusetts	5	610,800	7,030			11,022	78,500	221,194	220	22 50	6,720		428,820
Rhode Island	1	208,000	3,000			6,000		111,750	874	26 00	2,650		222,400
Connecticut	18	529,500	7,061	1,644		5,062	768,600	858,760	1,087	31 09	6,325	$5,000	667,560
New-York	60	1,181,300	8,580		44,649	18,908	5,554,150	898,314	528	26 00	18,686	195,000	1,428,968
New Jersey	58	1,016,843	10,480		14,549	4,507	1 994,150	320,950	6,764	27 76	8,162		629 273
Pennsylvania	131	7,620,066	163,702	20,405		325,967	8,939,998	5,488,891	50	27 68	152,506	219,500	8,909,907
Delaware	9	15,000	510	60			228,000	19,500	568	24 19	550		55,000
Maryland	17	760,650	10,179	8,989		10,455	246,000	439,511	1,295	28 38	10,000		771,431
Virginia	89	791,211	17,296	2,500		66,515	108,000	591,448	178	23 62	15,328		1,254,995
North Carolina	19	108,000			4,650		857,900	28,114		10 87	850		66,960
South Carolina									26				
Georgia	3	9,200	100				76,600	5,936		11 85	90		15,884
Florida									14				
Alabama	1	2,500	120				30,000	3,000		20 00	100		7,500
Mississippi													
Louisiana													
Texas													
Arkansas													
Tennessee	49	735,050	11,698	825	9,151	62,088		855,616	781	15 20	10,848	88,800	670,618
Kentucky	4	176,000	2,000	1,600			330,000	150,300	158	39 06	3,070		299,700
Ohio	11	620,800	18,675	2,900		22,755	465,900	604,498	708	33 61	14,416		1,076,199
Michigan													
Indiana	8	17,000	50		3,150		65,000	4,425	22	27 45	175		11,760
Illinois													
Missouri	2	42,100	1,904			9,884		24,509	101	20 00	969		68,700
Iowa													
Wisconsin													
California													
District of Columbia													
Total	422	14,495,220	251,491	38,844	78,787	538,068	14,510,828	9,898,109	13,178		278,044	468,500	16,7?7,074

QUARRIES.

MARBLE QUARRIES AT WEST RUTLAND, VERMONT.

THE appearance of these quarries as they present themselves to the eye of a stranger, is thus briefly described by a correspondent of the New-York Times:—

West Rutland, sixty-six miles south of Burlington, is a small town beautifully located in a fertile valley, surrounded on all sides by hills, which almost assume the size of mountains, and its whitewashed cottages afford to the eye a pleasing contrast with the verdure of the country at this delightful season of the year.

The two most valuable quarries, constituting the same vein, run in a north-easterly direction from the village, along a line of about half a mile in length, and, I was informed, there were indications in other parts of the neighborhood of the existence of marble, both of white and spotted gray. At Danby, 25 miles south of Rutland, there is another quarry of white marble, and at Swanton, in the northern part of the State, there is one of black, very much like that which is quarried in a small quantity at Glen's Falls, New-York.

The statuary marble of West Rutland is far more valuable for the works of artists than any Italian marble which is imported. At least I was told so by the proprietors, who said that the Italian marble sells now in New-York from $2½ to $3 per cubic foot, and it has been sold as low as $1 87½, whilst the statuary marble of West Rutland generally commands $4½ the cubic foot. Even at this rate, the proprietors (Messrs. SHELDONS, MORGAN and SLASON, and WM. F. BARNES) are not able to quarry fast enough to meet the demand, and *two blocks for busts, of one ton each, are now ordered from Rome, Italy.* As I thought it rather extraordinary that we should be "sending coals to New-castle," I was particular in my inquiries about this order from Rome for West Rutland marble, and learnt that it was not an American artist who had ordered it, but a native Italian sculptor, of great eminence in his country, who gave the preference to the West Rutland marble, as being easier to work with the chisel. The grain is finer, and it does not break or crumble as quickly as the Italian. There are upward of five hundred men employed at the two quarries in this vicinity, and besides five mills, which are turned by water, they have at one of the works an engine of eighty-horse power, which saws an immense quantity of slabs daily. The production annually is over a million of superficial feet, or one hundred and seventy-five thousand cubic feet, yielding about five hundred thousand dollars worth in value per annum. The product of all the marble quarries in Vermont amounts to something over a million annually, of which the West Rutland quarries supply one half in value, but not in quantity, as the statuary marble produced is of a superior quality to any that is found elsewhere. The layers of white marble at these quarries (nineteen) together are about fifty feet in thickness in the aggregate, along a line of half a mile, of which two hundred feet have already been explored and worked in an angle of forty-five degrees.

The situation of the first West Rutland quarry is really beautiful, and it would afford quite an agreeable recreation to any of our friends in New-York, to visit the locality. The quarry has been excavated in such a manner that, as you descend about seventy-five or eighty feet to the spot where the men are working with their long iron bars, taking out the marble in huge blocks, an immense projecting rock of limestone forms a semi-arch over the head, which protects the workmen from the heat of the sun or the inclemency of the weather. The works are within a short distance from the quarry, and here may be seen the marble in its crude state—blocks sawed half-way through into almost innumerable slabs, and the highly polished tomb and head-stones which ornament our cemeteries. The spotted gray marble, which is also found here, is chiefly used for mantels, and other ornamental works, in the houses in New-York and elsewhere. West Rutland is over 250 miles from New-York.

AMERICAN MARBLES.

The rare beauty of the marbles of Italy, Spain and Portugal, hitherto unequalled, will meet in this country with a successful rival, in the products of the great basin, lying between the bold and rugged Adirondack Mountains on the west, and the high sweep of the Green Mountains of Vermont on the east, crossing that rich and fertile valley in which Lake Champlain reposes; extending north to the confines of Canada, and south, with some interruptions, through the western part of Massachusetts and Connecticut, and the eastern part of New-York, to the shores of Long Island Sound.

Among the varieties to be found in this section are the *White*, much of which is of the coarse crystalline texture, suitable for building, but chiefly used for sepulchral purposes; with beds of the purest and fine-grained statuary marble.

Black, of a rich, deep, and unspotted color, of that solid and compact texture so requisite for the reception of a high and glassy polish.

Blue-veined, so closely resembling the Italian of the same hue that it is already being largely sold in its stead.

Variegated, with the yellow, purple, green and flesh-colored tints of the Sienna.

Fawn-colored, with veins of brilliant black—a unique and most beautiful variety, destined to be considered the pride of American marbles.

Verd-Antique. The characteristics of this rare species of marble are so graphically described by Prof. C. U. Shepard in his Geological Report of Connecticut, that I cannot do better than to quote his own words:—

"The genuine verd-antique is an aggregate of white limestone, green talc, and blackish green serpentine, the last ingredient being so arranged through the two first, in angular, ovoidal, cubical, and vein-like masses, as to impart to the rock a brecciated appearance. Wherever in a block these pebble-like masses are wanting, the verd-antique ceases, although a very handsome green-veined marble may remain. This precious marble was originally obtained, as it is supposed, in the neighborhood of Thessalonica in Macedonia; or as some maintain, from Lacedemonium in the Morea. At present, however, it is only met with in small fragments and scattered blocks among the ruins of Roman and Etruscan cities: and so scarce has it become that its price in Paris is thirty dollars the cubic foot. Its use is therefore extremely limited, and confined only to the more costly articles of furniture."

Had the professor written the description of a specimen in my cabinet now before me, he could not have expressed himself in different terms, the specimen and the description accord so intimately. An extensive bed of this rare marble will be opened during the ensuing season.

In addition to the above enumerated varieties, there are *Green*, *Yellow*, *Pink*, and *Blue* marbles, favorably located, and in sufficient quantities for marketable operations.

The Vermont quarries are worked to the extent of between two and three millions of dollars per annum; the New-York quarries afford nearly two millions of dollars a year; and the Massachusetts and Connecticut quarries together yield nearly the latter amount, forming an aggregate of seven millions of dollars per annum for the four States, and this, too, under circumstances far from propitious for the full development of the marble sections to the utmost of their capacity; and such is the demand for marble for building and other purposes, that were the yield four times the above amount it would not overstock the market; in fact the demand is almost unlimited.

STEPHEN P. LEEDS, *Geologist.*

SOUTHERN GRANITE AND SLATE.—Arkansas, whose boundless resources will soon be developed by means of railroads, it appears, possesses inexhaustible quarries of the finest and most durable qualities of the material. Says a correspondent of the Memphis *Eagle*, of the 7th:—

"In the State of Arkansas, in the immediate vicinity of Little Rock, is as fine and good granite as is to be found any where in the world. I was there last fall, and saw it myself; and can say that it is not only as fine, but, if any difference, finer than that I recently saw in New Orleans, to which I have referred above. I was credibly informed while at Little Rock, that, a few miles from that city, is what is called the 'Granite Mountain,' about thirteen miles long, two and three miles broad, and a quarter of a mile high. Here, then, is an almost inexhaustible quantity of this material."

The reason why these granite quarries have continued so long undisturbed—their untold riches permitted to remain in a state of nature—as given by this correspondent, is the difficulty, the almost impossibility, of getting such bulky and heavy material to a market, which has existed ever since Arkansas was discovered.

The slate quarries of Arkansas also bid fair to be exceedingly valuable. We are now mostly supplied with slate from Wales and from Pennsylvania. The Arkansas slate is found in veins about a mile wide, which cross the Arkansas river at Little Rock, and extend southwestwardly as far as the Ouachita river, and some distance in the opposite direction. Near Little Rock it is most accessible. There the vein is seventy-five feet thick above the river bed, which, multiplied by the area of the vein belonging to a company, one hundred thousand feet, gives seven million five hundred thousand cubic feet of slate. Should the quarry go to a depth of three hundred feet, the total yield would be thirty million cubic feet. From a cubic foot of rock it is estimated that, allowing one-third for waste, a workman can split fifty good smooth slates, of sufficient thickness for roofing. This gives a full aggregate of fifteen hundred million slates, or fifteen million square of one hundred feet of regular size for roofing.

A Cincinnati company have obtained a charter, which runs for fifty years, and have purchased a large tract of land, with a view of supplying the Cincinnati market with slate.—*N. O. Bulletin.*

MISCELLANIES.

AEROLITES: THEIR ORIGIN.

These are either globes of light, shooting stars, or blazing metallic stones. These latter are called aerolites, and have been known ever since the dawn of history. The largest recorded one fell in Brazil, and was estimated to weigh fourteen thousand pounds. They are computed to move at the mean velocity of twenty miles a second. In three or four cases they have killed men in falling. Towards the close of the last century, nearly three thousand of these stones, mostly small, however, fell in France, and almost simultaneously, immense showers of them fell in India and other places.

It was formerly believed that aerolites were stones ejected from volcanoes. Some philosophers, however, maintained that they originated in the fusion of earthy and metallic materials by electricity—the passage of the latter from the upper atmosphere producing the meteoric appearance, they said. Others asserted that the elements of the aerolites existed in the atmosphere, and that electricity combined and precipitated them on the earth. It is now generally believed, by men of science, that aerolites are independent bodies, moving through space, which on approaching too close to the earth, become ignited, rush towards it, and are precipitated by attraction upon it. Laplace, Humboldt, and Herschel, all hold, or held, this opinion.

Aerolites have frequently been analyzed. But they contain no new substances, and generally are chiefly composed of iron; eight metals, and six alkalies and earths, have been detected in them; and, in addition, carbon, sulphur, phosphorus, hydrogen and oxygen. Next to iron, cobalt and nickel most frequently appear. If the cosmical theory of Humboldt and Herschel is correct, we may fairly conclude that the composition of matter, throughout space,

whether in these smaller independent bodies in our globe, or in the larger planets, is the same. In that event iron is the principal metal of the Universe.

GYPSUM.

The Fort Smith Herald publishes a letter from the pen of Dr. Shumard, of that place, who acted as geologist in the expedition under Capt. Marcy, in his reconnoissance of the headwaters of Red River. We give the material portions of the communication:

This field is probably the largest in the world, and extends from the Wichita Mountains to within a short distance of the nearest Mexican province. Throughout its entire extent the gypsum presents itself to the surface in such a manner as to be very easily worked, and is of the purest quality. Not unfrequently we travelled for miles over continuous beds, which from their snowy whiteness, and the great abundance of glittering *Selenite* (*transparent gypsum*) they contained, added greatly to the interest of the scenery; while here and there immense bluffs—often several miles in extent, and thickly capped with the same material, projected to the height of two or three huudred feet above the level of the surrounding country. In many places it was observed to be twenty feet in thickness.

Gypsum which, when burnt, produces the Plaster of Paris, is one of the most important substances in nature. Besides being one of the very best fertilizers of the soil, it is largely used for building and ornamental purposes, and is every year becoming more and more important, in a commercial point of view. Hence its discovery in inexhaustible quantities, cannot but be looked upon with the utmost degree of interest.

THE EUREKA DIAMOND AND CONCOMITANT CIRCUMSTANCES.—The so-called Eureka Diamond was on exhibition yesterday in a room over the Magnolia Saloon, on Kearny street. The room could not be missed, as the door thereof bore a placard, on which were the words—"Eureka Diamond," in large letters. Quite a number of our citizens, drawn from curiosity, visited the apartment to inspect the "wonder." Here were two miners who state they found the article about two miles from Columbia. These individuals were dressed in miners' clothes, and one of them, from some singular motive or odd conceit, declines to give any other name than "Old Grizzly." The throats of how many monsters he has cut we have not learned; certain it is that he does not bear many marks of being a tough old mountaineer, who has lived among the snows and forests until he has become as gnarled as an aged oak. He is quite a young man, and has a daguerreotype in which he is represented dressed in a fantastical style, with a chaplet of beads wound round his head, and leaning on a gun.

The "Diamond," or crystallized quartz, or whatever it may be, is about as large as the end of one's thumb, being an inch long and about two-thirds of an inch thick. It was at first inclosed in a glass about a foot square and four or five inches thick, in the centre of which it was suspended by two thumb screws. But later in the day it was taken out, passed round from hand to hand, and submitted to the close inspection and remarks of the visitors.

The owners state that they have fixed upon no particular price for the article, but intend to take it to New Orleans and elsewhere. They state that it has been tested in various ways by a Doctor Banks, who pronounces it the genuine article. It bears unmistakable evidences of a crystalline character, and of having been pounded with a hammer. One side has every appearance of rough dirty glass, while the faces from which slivers have been broken are smoother and cleaner, allowing the vision to extend into its interior structure. We could discover no brilliant lights and colors, the interior looking like clouded quartz. The smooth faces could be scratched with the utmost ease by several diamonds that were in the room. Mr. "Grizzly," however, states that he has scratched diamonds with it. The owners seem to be quite confident

that it is a diamond, and quote glibly from Ure and Dana in support of their assertions.

We noticed at times that they were uneasy, and manifested considerable feeling, when parties, who one would think should be competent to judge of such matters, expressed doubts as to its being a true diamond. Among the visitors were several of our leading jewellers, and if we are to judge any thing from their remarks, we should certainly be led to suppose that the article is not what it is claimed to be. It was interesting to listen to the various remarks that were made. One man would come in, pick the article up, and forthwith be vehement in protestations that it was a diamond. On the other hand, we met one or two jewellers who, without having seen it, were willing to bet ten to one that it was not a diamond. Again, there were jewellers present in whom, from their manner, one might be led to place confidence, and who, after examining it, and testing it with other diamonds, stated that if it was a diamond, they at least had never seen one so soft. One thing we could not but notice—to wit, that the fractured surfaces are in some parts shell-like and not flat. Some are inclined to think it a piece of crystallized quartz; others are inclined to think it an opal; others are inclined to think it a white topaz—we are inclined to think it a humbug.—*San Francisco Times.*

FOREIGN POSTAGE ON PAMPHLETS AND MAGAZINES.

The present rates of postage on pamphlets and magazines between the United States and Great Britain is so enormously high as almost to serve as an entire prohibition on the *inter-circulation* of these valuable and important publications. On all those American magazines whose subscription price is three dollars, the annual postage between the two countries amounts to nearly two years' subscription, or almost six dollars. The English monthlies are rarely seen in the United States, or the English Quarterlies in the original form. The more acceptable and valuable ones are republished here either entirely, or in parts.

This is a part of the old system of which one feature was lopped off by the adoption of cheap letter postage, and which it is to be hoped will, in time, be entirely reformed. It presents a serious barrier to the circulation of a work like the *Mining Magazine*, whose nature and object is so well understood and appreciated in England and on the continent, and whose capitalists and scientific men are so desirous to become better acquainted with the inexhaustible mineral resources of our country.

It is gratifying to know, however, that the importance of American pamphlets and magazines is such that they do circulate largely in England and in Europe. Hunt's Merchants' Magazine, particularly, not only receives a considerable circulation in England and Paris, but it is found on the Rhine, and penetrates far into the interior of Germany, and this, in spite of the prohibitory rate of postage.

We are happy to perceive that Mr. Hunt is already at work with his untiring energy to effect a modification of this non-intercourse regulation respecting periodicals. His letter on the subject, which is annexed, expresses its importance, and the active interest taken in it by himself.

OFFICE MERCHANTS' MAGAZINE.

New-York, *June* 14, 1853.

To the Editor of The Mining Magazine:

I take the liberty of inclosing a copy of a letter from the Postmaster-General, in reply to a note I addressed to him, touching the rates of postage on pamphlets and magazines. As the information contained in this letter is of some importance to the public generally, as well as to the proprietors of such works, its publication, in the columns of your Magazine, will not, perhaps, be without interest to your readers.

It will be seen by the letter of the Postmaster-General, that the postage to Liverpool on a magazine of the weight of the *Merchants'* (6 ounces), amounts to *five dollars and seventy-six cents* per annum, that is, *seventy-six* cents more than the subscription price of the Magazine. Now, the freight on a barrel of flour, weighing 196 pounds, from New-York to Liverpool, seldom exceeds 25 cents, while the postage on a magazine of six ounces is 24 cents. If bulky articles like a barrel of flour can be transported with benefit to the shipper at a low rate, is it not reasonable to suppose that publications, if charged proportionately low, would likewise pay a profit?

Your friend and servant,

Freeman Hunt.

Post-Office Department, June 2, 1853.

Sir:—Your letter of the 28th ult. is before me. The Postage Tables, &c., desired by you, were forwarded to your address a day or two ago.

In speaking of the high rate of postage on pamphlets and magazines to and from England, you remark that "the postage on a magazine of the weight of *The Merchants'*

(6 ounces) is 24 cents;" and this sum you appear to regard as the full postage to its destination. On looking at the postage tables above referred to, however, you will observe that this (four cents an ounce, *or fraction of an ounce*, where the weight exceeds two ounces) is only the United States postage; and that all such works are subject to the same rate, as an additional charge, in England. Therefore, the entire annual postage on a monthly periodical not exceeding six ounces in weight, sent to or received from England, is $5 76. This is in accordance with the stipulations of the Postal Treaty of 15th December, 1848, between the United States and Great Britain. It is true, either party has a right to reduce its own postage, and until our postage act of 3d of March, 1851, went into effect, raising the rates of postage, the United States' charge on pamphlets and magazines to or from Great Britain, was but one cent an ounce. The British Government, still keeping their charge up to four cents an ounce, the United States' rate under the act of 1851 has been permitted to stand unchanged.

In December last the attention of the British Post-Office was drawn to this subject, and the proposal was made by this Department to reduce the postage on pamphlets and magazines to one cent an ounce, or fraction of an ounce, on either side, so that the combined rate should be but two cents an ounce. This proposition the British office declined, and asked the adoption of a Book-Post, now generally in operation between the United Kingdom and British colonies. The details of this plan are given in a circular of the British Post-Office, a copy of which I inclose herewith. In extending this Book-Post to the United States, they proposed that the postage be divided as follows: The British office to receive two-thirds, and the United States one-third, when the Atlantic conveyance should be by British packets; and the United States office two-thirds, and the British one-third, when the Atlantic conveyance should be by United States packets. This proposition, which was first made in October, 1851, was declined by Judge Hall and Mr. Hubbard, my predecessors in office, for reasons which I deem conclusive.

I intend to take up this subject of magazine postage to England for further and more particular consideration at the earliest day practicable, and shall do all in my power to induce the British Office to agree to a reduction. I have already made an order reducing the rate to the Continent, &c. to two cents an ounce.

Your obedient servant,
JAMES CAMPBELL, *Postmaster-General.*

To Freeman Hunt, Esq.

HUNT'S MERCHANTS' MAGAZINE AND COMMERCIAL REVIEW.

Vol. 28, No. 6, New-York, Freeman Hunt.

This celebrated periodical has, with the present month, completed its twenty-eighth volume. Fourteen years ago its first number was issued. The idea and plan of the work were original with its present editor and proprietor, who has been its sole conductor from the start. During this long period, in which he has been working out and expanding his original conception, hundreds almost of similar works have arisen and disappeared around him, and his stands, with a single exception, we believe, the oldest magazine in the country. Yet with all its age, as compared with others, it has not in itself reached maturity; its number of subscribers is constantly increasing, and is larger at this day than ever previous; it has been so judiciously and discreetly conducted, that it may be said to have never met with any thing adverse, which could retard or check its onward career. Meantime it has found patrons in almost every country of the civilized world—the United States, British North America, South America, England, France, the States of Germany, Turkey, India, China, and the Sandwich Islands. Some numbers of every monthly issue almost complete the circuit of the globe, while entire sets of the work have become fixtures in many merchant ships for the service they can render to the comanders, and go wherever commerce floats American keels.

Its contents embrace all departments of commercial transactions, as well as the financial and moral principles upon which business should be conducted. The facts and results of commerce, the achievements of industry and activity, are stored in its pages, in ample details, for every year of its existence. It is the only really national periodical on commercial subjects, which we possess, and its importance therefore, to the merchant and the statesman, can scarcely be over estimated.

The leading articles of the number before us are upon the following subjects:—"Financial History of the Reign of Louis Philippe;" translated from the French of M. S. Dumon, late Minister of Finance. "A Sermon on Commerce;" by Rev. J. T. Hendricks. "The Milk Trade of New York." "Traits of Trade, Laudable and Iniquitous;" by a Merchant of Massachusetts. "Rise and Fall of Lake Ontario;" by E. Merrium. "Sketch of the Life of T. P. Schaffner of Kentucky;" by Geo. D. Prentiss. "The Moral Results of Slavery;" by T. W. Higginson. The commercial department comprises a large portion of the number. They are exceedingly rich in details respecting every branch of trade.

The next number is the first of a new volume, affording an excellent opportunity to those who have omitted to patronize this work to remedy their remissness, and become the readers of the most valuable of our commercial periodicals.

THE

MINING MAGAZINE.

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

CONTENTS OF NO. II., VOL. I.

ARTICLES.

ART. PAGE

I. EXPLOSIONS IN MINES, AND COLLLIERIES, AND METHODS OF VENTILATION. Read before the Society of Arts. By ROBERT BLACKWOOD, of Kilmarnock 99
II. THE MINES AND MINERAL RESOURCES OF AMERICA 109
III. REPORT ON THE MINERAL TRACT OF THE EAST TENNESSEE AND CHEROKEE COPPER COMPANY. By J. D. WHITNEY, U. S. Geologist 114
IV. REMARKS ON THE ORIGIN, OF COAL FIELDS, AND THE TIME REQUIRED FOR THEIR FORMATION. By Sir CHARLES LYELL, F. R. S., &c 121
V. REPORT OF THE MINESOTA MINING COMPANY, (LAKE SUPERIOR) for the year 1852 136
VI. ELEMENTARY GEOLOGY 135
VII. QUARTZ MINING OPERATIONS IN CALIFORNIA 144

JOURNAL OF MINING LAWS AND REGULATIONS.

Act of Michigan to authorize the Formation of Mining Corporations 150
Local Mining Laws of California 153
Foreign Miner's Tax 154
Australia Gold Mining Law 154

COMMERCIAL ASPECT OF THE MINING INTEREST.

Mining Stocks in New-York 155
Management of Companies 155
Import of Metals into New-York 156
Mining Stocks in Boston 156
Fluctuations in Mining Stocks at Boston 158
Rise in Mineral Land at Lake Superior 158
Prospects of the Anthracite Trade 159

JOURNAL OF GOLD MINING OPERATIONS.

California Gold Mines 160
" Northern Mines 161
" Southern Mines 161
Helvetia and La Forsyth Co. 162
Australian Gold Fields 162
Product of Australia 163
New Zealand Gold Fields 164
Garnett and Moseley Mines in Virginia 164
London and Virginia Gold Mining Company 167
Freehold Gold Company 167
Brazilian National Mining Association 167
Petrie's Patent Gold Refining Process 168
Increase of Gold 170

JOURNAL OF COPPER MINING OPERATIONS.

Lake Superior Copper Region 171
Copper Falls Mines 171

PAGE
Waterbury Co........ 173
Toltec Consolidated Co........ 173
Shipment of Copper for April 1853........ 174
North Carolina Copper Mines........ 174
Tennessee Copper Mines........ 175
Virginia Copper Mines........ 176
Analysis of Menasses Copper Ore........ 177
Dolly Hyde Copper Mine........ 177
Copper Trade of Great Britain........ 178
Consolidated and United Mines of Cornwall........ 179
Ancient Metallurgy........ 180

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

Ulster Lead Mine........ 182
Western Lead Mines........ 184
Morris and Johnson's Patent Metal Depositing Process........ 184
Middletown Silver and Lead Mines........ 185
Report of Dr. Percival........ 186
A Visit to the Middletown Mine........ 188
Lake Superior Silver Mining Company........ 189
Analysis of Silver Ore........ 189

COALS AND COLLIERIES.

Exhibition of Coals at the World's Fair in London........ 190
Anthracite Coal Trade for 1852........ 193
Lehigh " " "........ 193
Coal Trade of Cleveland, Ohio........ 194
Anthractie Coal Trade for 1853........ 194
The First Steam Engine in a Mine........ 195
Cumberland Bituminous Coal Trade........ 196
Coke as Fuel for Locomotives........ 196
Coal in Iowa........ 197
Northern Oregon........ 197

IRON AND ZINC.

Iron Region of Lake Superior........ 198
North Carolina Iron........ 198
On the Application of the Blast to Smelting Furnaces........ 199
Albany Iron Works........ 200
Bar Iron Manufacture........ 202
Products of Swedish Mines........ 202
Pig Iron........ 202
New Jersey Zinc Co........ 203
Zinc and Manganese Mines of Arkansas........ 204

QUARRIES.

Marble for Pittsburgh........ 205
Marble in Wisconsin........ 205
Gardiner's Steam Drill........ 205

MISCELLANIES.

Fossil Animal Remains in the West........ 207
The Almaden (Quicksilver) Mine, California........ 209
Tin Mine in South America........ 210
A Sulphur Mine........ 214
Gwynne's Reäction Centrifugal Pump........ 214
New Motive Power........ 214

RECENT PUBLICATIONS.

Lead Mines of Missouri........ 215

THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. I.—AUGUST, 1853.—No. II.

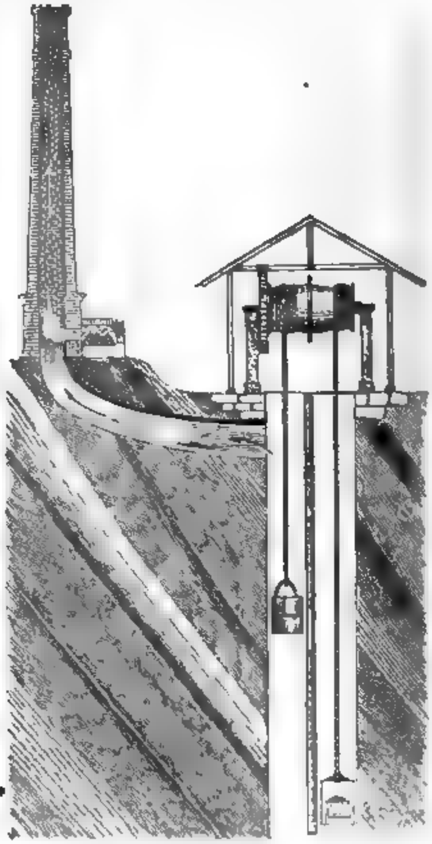
ART. I.—EXPLOSIONS IN MINES AND COLLIERIES, AND METHODS OF VENTILATION.*

For the safe and efficient working of any mine, a proper system of ventilation is necessary for the free respiration of the workmen, and also for the purpose of carrying off the noxious and dangerous vapors and gases that exude from the coal as the work proceeds. The development of carburetted hydrogen gas or fire-damp—the dread of the miner and the cause of such fearful loss of life—is inseparable from mining operations, being produced from the decomposition of the vegetable matter of which the coal is composed, and lies dormant and pent-up in the numerous cavities and fissures of the coal-seam. In deep mines, and those in which coal is of a rich quality, this gas is given off in great abundance from the numerous cavities and pores in the strata, being intersected and laid open by the operations of the miners, and is constantly being drained off as fresh faces of coal are exposed. This gas sometimes exists in the seams under very considerable pressure, and rushes out into the workings with great force. When mixed

* The subject of explosions in mines and collieries, particularly the latter, has attracted serious attention in England during the last year and a half. A report was made to the House of Commons "on Coal Mines" last year, which was ordered to be printed. In this report it was stated, that in less than six months of the year nine hundred lives had been lost by mine explosions. It is chiefly old and extensive mines which are liable to these accidents, such as are more rare in this country, although they may take place in those which furnish coal easily decomposed, like the bituminous coal of Virginia, and some of that in Maryland, Ohio, and Illinois. We have placed above a very interesting paper treating of these explosions, and the means of preventing them, which was recently read by Mr. Robert Blackwood, of Kilmarnock, before the Society of Arts, in England. And, in order to present more completely the view taken of the subject, we have added, although somewhat out of place, a brief paper which lately appeared in *Chambers's Edinburgh Journal*, respecting the views presented in the Report to the English House of Commons on this subject. We expect to receive a copy of this report at an early moment.—Ed. *Min. Mag.*

with a certain proportion of common air, this gas becomes highly inflammable if brought in contact with flame, giving rise to fearful explosions and consequent loss of life when a miner carelessly, or through ignorance perhaps, exposes his naked lamp or candle to this treacherous atmosphere. Hence the necessity for a vigorous circulation, and an ample supply of fresh air at all times to the workings, to dilute the atmosphere of the mine below the firing point, and thereby render it harmless and safe for the operations of the miners.

Except where the ventilation is natural (a system that cannot be sufficiently deprecated), the means almost universally adopted for clearing and keeping the mine free of this explosive atmosphere is ventilation by rarefaction. In a mine where only one shaft is sunk to the coal, a partition or brattice, generally of wood, is put in, dividing the shaft into two sections from top to bottom, the one termed the upcast, the other the downcast shaft. At the bottom of the upcast shaft a powerful furnace or cube is kept burning, which has the effect of rarefying the air and producing an ascending current in the upcast shaft; the cold, pure air going down the downcast, to fill up the partial vacuum caused by the rarefaction, communicates motion to the air throughout the mine, and thereby causes a current of fresh air to circulate and sweep along the face of the coal in process of being wrought, diluting and carrying off the carburetted hydrogen, as it is produced, through the furnace to the upcast shaft, and thence to the external atmosphere. In the annexed cut, the furnace is represented at the top of an outlet of the upcast shaft, at which a high chimney is erected—a method sometimes adopted.



It will be at once appa-

rent that a copious air-current, and the keeping of it in its proper course, is of the first importance, as upon it depend the ventilation of the mine and the lives of the men employed; as in almost every instance where accidents from explosions of fire-damp occur the cause may be almost invariably attributed to an insufficiency of air, either from a defective furnace, contracted air-courses, or the current being allowed to leak or waste, or otherwise improperly applied. In the process of excavating the coal, the current is kept up to air the face of the workings, by stoppings of brick and mortar being put in, from time to time, betwixt each row of pillars as the work proceeds; so that what was formerly a room or bord now becomes a passage for the intake of fresh air as each pillar is formed, thus making a continuous air-course from the bottom of the downcast shaft, round the face of the workings, and back again through the furnace to the upcast shaft.

Explosions of fire-damp frequently arise from want of attention to the doors in the drawing-roads and air-courses, which, except when a miner is passing with his load, should always remain closed. These doors are, in some collieries, kept by boys, called trappers, and in others they are self-acting swing doors. Colliery managers are divided in opinion, on which of these two systems most dependence can be placed. In either case, this department of the underground management requires the most vigilant oversight; neglect of this is ruinous to the entire ventilation. It matters not how superior and complete the other arrangements of the mine are, the most powerful furnace will be found inadequate for the ventilation of the workings in advance of any door left open, as the current will entirely abandon the face of the workings, and rush straight to the furnace by the shortest and most direct course it can find. The ventilating current is then diverted out of its course, fresh air is no longer carried forward to the workings in advance of this point; the atmosphere of the mine gets vitiated, and gradually becomes fiery and inflammable from the accumulation of fire-damp in the working faces, and the miners, meanwhile being unaware of any negligence, and trusting to the usual supposed safety of the mine, are insensibly surrounded by an inflammable atmosphere, and an explosion is inevitable. Double doors, whether self-acting or kept by trappers, should invariably be fitted in the air-course and main drawing-roads, especially where there is frequent passing. These doors are never both open at the same time, but are arranged so as to open and close alternately—the one shutting before the other opens, and thus acting as a guard upon each other. In well-conducted mines, especially those of a fiery nature, where working with naked lights is considered precarious,

the air-course and drawing-roads are guarded with a set of three doors; thus rendering accidents from leakage or waste of fresh air at this point almost impossible. Were this the prevailing custom, loss of life from explosions of fire-damp would be of much rarer occurrence.

Explosions of fire-damp frequently occur from another cause, even with an abundant supply of pure air, and a powerful ventilating current in the air course. This is the case when a heading or drift has been driven so far in advance of the air-course that the end or face of it is out of the reach of the current. In coal-seams where fire-damp is given off in great abundance, it is found necessary in excavating a heading or drift to carry up a little fresh air to ventilate it, whenever the end or face of it is considered beyond reach of the current. This is done by fitting in a brattice of loose boards in the heading, the boards being laid on edge from the pavement to the roof, dividing the heading into two sections, a scale of air being taken up the one side of the brattice to air the face and then returned down the other side into the air-course as before. Special attention should be paid to this where the strata are much inclined to the horizon, as carburetted hydrogen being specifically lighter than common air, naturally floats uppermost, and, gradually rising to the highest point, ultimately accumulates in the end of the heading; and unless air be taken up to dilute it, has no tendency of itself to come down to the air-course to be carried off. Explosions of a trifling nature, attended with little loss of life, occur very frequently in these headings, and extend no farther than the air-course, being there met and extinguished with fresh air; but should the air current, after travelling along a series of working faces, be so far vitiated as of itself to be also inflammable, an explosion even of a comparatively trivial kind is attended with the most disastrous results, as the fire in such a case is taken up by the current, and communicated to the atmosphere of the whole mine.

Loss of life from explosions of fire-damp may be divided into two classes; first, death caused by scorching and the violence of the explosion; and secondly, death by suffocation from choke-damp. The result of some of these explosions is most disastrous; when ignited at any point the flame spreads itself throughout the workings in the neighborhood, and that portion of the mine becomes a mass of living fire: so intense is the heat produced that the timber is generally all destroyed, and sometimes the pillars of coal are found to be charred to the depth of several inches. The dross, rubbish and small particles of coal produced from the workings, become ignited, and the enormous expansion of the air from such a temperature drives every thing before it; doors, brattices, props, loose masses of coal, together with any

unfortunate miners that may be within its influence, are carried out with irresistible force through the air-course, or drawing roads, towards the shaft,—the only outlet where the explosion can expend itself. The carbonic acid gas, or choke damp, which is produced in great volume from the previous combustion, is drawn back again into the mine, to fill up the vacuum caused by the expansion, and envelopes the miners, so that those who escape the violence of a scorching fire perish from suffocation; as in almost every case where only one shaft is sunk, the brattice is destroyed, and any attempt to restore the ventilation in time to save the men is hopeless. This is, perhaps, one of the strongest arguments in favor of the double shafts, now so common in the north of England. The wooden brattice in a single shaft being constantly getting out of order, from moisture and its proximity to the furnace, never, even when in the best condition, perfectly isolates the one shaft from the other; neither can it ever be so air-tight as when two distinct shafts are used, where the mass of earth between them becomes a natural brattice, and also, when an explosion does occur, is of sufficient strength to withstand the shock, so that the ventilation can be restored in a comparatively short time, and the means of raising the miners to the surface still remain available.

From what has been advanced it will be plain that under the present system of ventilation by rarefaction, the safety of a mine depends on a powerful furnace, a capacious air-course, the headings well bratticed, and an ample ventilating current.

It is to be regretted that, at the present day, when the loss of life from explosions of fire-damp is so very frequent, so much dependence should still be placed on natural ventilation. This system is at once feeble, variable, and uncertain in its action. Instead of being urged on by a vigorous furnace, the ventilating current is caused by, and merely dependent on, the excess of temperature that may chance to be in one shaft above that in the other, so that the current throughout the mine cannot be otherwise than weak, sluggish, and totally insufficient for the purpose intended. The natural ventilating current in a mine unassisted by a furnace is so feeble as to be most materially affected by any change of temperature, causing the air in the mine, that should otherwise be circulating briskly, to be stagnant and utterly dead. So imperfect is the ventilation in such cases that upon any sudden change of the wind or temperature, the current is sometimes completely reversed, so that what was formerly the upcast shaft becomes the downcast, and the return or vitiated air is drawn back again into the workings as intake or fresh air. This being a circumstance over which no one has any control, the ventilation of the mine is for the time destroyed, and any

trifling current that may be generated is wholly dependent on the air in one of the shafts assuming a higher temperature than that in the other. Under a system of ventilation so very imperfect, it is not to be wondered at that accidents from explosions, and those of the most appalling kind, should occur. Until this system is entirely abolished, loss of life must continue, and the proprietors and managers of such collieries be in a great measure culpable.

A very decided improvement in the system of ventilation is now being pretty generally adopted in the northern districts of England. This consists in working the mine in isolated districts, and splitting the intake air into several distinct columns at the bottom of the downcast shaft, and appropriating one separate column to each district. By this means the faces are aired more perfectly; each current has a much shorter course to travel, the tendency to leakage is less, and the return air is not so much charged with fire-damp,—admitting of a freer use of naked lights than when the air is brought round the faces in one undivided column, and also, when an explosion does occur it is generally confined to the district in which the gas has been ignited.

It is to be feared, that even under the most approved system of ventilation at present adopted, accidents from explosions of fire-damp in mines and collieries can never be entirely averted. The method of splitting the air and working in districts, however, is certainly a great step in advance, and is at present the most perfect system of ventilation known. If carried out judiciously, and with vigorous discipline, ordinary caution on the part of miners will be a sufficient safeguard against explosions, and will, if it do not wholly avert, at least greatly tend to lessen the number of such direful calamities.

COAL-MINE EXPLOSIONS.

Of the many Blue Books that have recently been laid before Parliament, none is more full of matter for grave cogitation than that now to be referred to on coal-mine explosions. This Report, only one of a series, makes known, in a very emphatic way, the terrible loss of life in coal-mines; one fact alone being sufficiently appalling—the loss of 900 lives by mine explosions within the short space of twenty-one weeks, in the year 1852.

All reports on this subject of serious concern concur in stating, that for explosions, the only proper remedy is better ventilation; and they all deprecate placing too great reliance on the safety-lamp. They affirm, that while many accidents are traceable solely to the use of this instrument, it is perfectly compatible with science to reduce these melancholy occurrences to a small fraction of their present number, and that, ultimately, mines may be rendered perfectly safe. Little good, however, can be done, while operative miners entertain an undue, and what may be called a superstitious confidence in their Davy lamp, no matter how much that lamp may be out of order. With them, this useful companion is not so much a delicate scientific instrument, as a thing of talismanic power. Danger may be most imminent—the lamp completely out of trim

—but all is right, provided the miner has *only* a Davy. Stories, most ludicrous but for their associations, are told in abundance respecting their childlike simplicity. We select two. The first was brought out in evidence at the investigation of an explosion which happened last year in Staffordshire. It there appeared that the fireman, who ought to have examined the safety of the workings ere the miners entered, had, on the morning of the accident, deputed this duty to another person. The deputy went round with a lamp not closed, and was seen going into the workings closely followed by some men and boys, each with a *lighted candle* in his hand! Again, T. E. Foster, Esq., an extensive viewer, relates, that last year he visited a pit in Lancashire. "On going down, the overlooker told me: 'We work this mine entirely with safety lamps.' I said: 'Very well, Jonathan. I should like to see these lamps, that they are all right before I go in,' The first lamp he put in my hand was Clanny's, and between the gauze I could put my little finger in. I said: 'This will not do; I will take one of the others.' I examined one, and the gauze was perfect, but very dirty. We proceeded along the railway from the bottom of the shaft. And in the face of the workings every man had a Davy lamp; but every man had the gauze out, and it was a naked light! I said: "If you are not more particular than this, you will have a blow-up.' And next week they had it." So much for mere carelessness; but we shall by and by advance more serious charges against the lamp. Meanwhile, as to know the disease is half the cure, let us look for a moment at the dread agent of destruction.

The reader who takes his idea of a gas from the ordinary illuminating medium of our streets, will, in studying *fire-damp*, find himself not very far off the mark. Relieved from the pressure of the superincumbent strata, light carburetted hydrogen exudes in great abundance, often from almost every pore of the coal in our mines; and on examining our gas-works, we find ingenious machinery to separate and convey away the tar, ammonia, and the other chemical products of the distillation of coal, from the carburetted hydrogens, the only useful ingredients for the purposes of light and heat. If so, why do we not hear of catastrophes in our streets and parlors similar to those so much dreaded under ground? The reason is simple. Ask any chemist, and he will tell you, that the danger lies not in any property of the gas or gases themselves, but only when they are combined in certain proportions with the oxygen of atmospheric air. Every housewife knows, that if our ordinary coal-gas be allowed not to burn, but to escape into the atmospheric air, an explosion will follow the introduction of a light into the room, rivalling only in degree the dread catastrophes of the mines.

Though, from its small specific gravity, light carburetted hydrogen easily escapes into the atmosphere, the coal still retains a large portion of it; and this has been amply proved by experiments of a most painful nature. Even coal-ships at sea have been the scenes of these demonstrations. For instance:—"On the 5th August, 1816, the ship *Flora*, of London, having just taken a cargo of coal on board in Sunderland harbor, blew up with a terrible explosion; the deck-beams were broken, and the decks torn up. On the 4th July, 1817, the *Fly*, of Ely, lying at Brandling-staith, on the Tyne, with a cargo of coal just taken in, the gas from it exploded, burned the captain in the cabin, tore up part of the deck, threw a boat from the hatches, and did other serious damage. Upon the 31st July, 1839, the sloop *Enterprise*, when at sea, with coal, from Pembroke to Newport, Isle of Wight, had an alarming explosion, which fortunately only frightened, but did not injure, the crew. And the schooner *Mermaid*, of Guernsey, upon the 29th August, this year (1852), lying at South Shields, sustained an explosion; she had been laden that day with Hilda coal, and the hatches immediately battened down, when, six hours after, the gas from the coal exploded at the forecastle-lamp; one man was knocked down, and much burned in the face, another injured, the mate struck down in the cabin, and a hatch started."

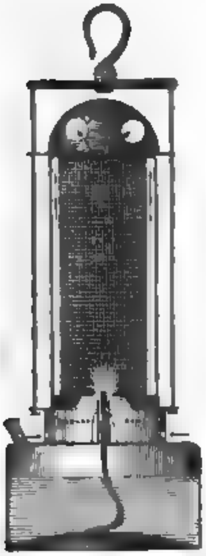
It is very remarkable, that it is only with a certain quantity of atmospheric

air the fire-damp explodes; *minus* or *plus* that quantity, and the danger vanishes. In three or four parts of atmospheric air to one of carburetted hydrogen, there is a slight explosion; but the most terrible calamities happen when the mixture is *seven* parts of carburetted hydrogen to *one* of atmospheric air. The margin of explosive quantity appears to be from about five to thirteen; above or below these points, and there is no explosion. Hence we see the necessity for a thorough ventilation in mines; for any system by which an imperfect quantity of air is diffused, so far from diminishing, only increases the danger. Another striking anomaly is, that, dreadful and terrible as the explosion itself is, it is only the means for the elimination of an agent of destruction still more fatal. The miner may not have suffered the mechanical violence of the explosion, but frequently he escapes only to die placidly and surely by the fatal after-damp. A principal ingredient is the deadly poison, carbonic acid; and so fatal is it, the committee inform us, that it was stated in evidence, that 70 per cent. of the deaths from explosions were occasioned by this after-damp. So speedy is its action, that Mr. Mather, about two years ago, entering a pit where it preponderated, was taken out insensible in a few minutes. He says: "You are struck down, and you scarcely know how or why; you naturally sink down asleep." Those who have suffered from its influence may easily be known from those who have died by the explosion; as is shown in the following extract, which likewise proves that dangers, perils, and heroism are not confined to battle-fields or the raging deep. It relates to the explosion of the St. Hilda pit, in 1839:—"The deadly gas, the resulting product, became stronger and stronger as we approached. We encountered in one place the bodies of five men who had died from the effects of the gas, and had apparently died placidly, without one muscle of the face distorted. Then there were three more that had been destroyed by the explosion; clothes burned and torn, the hair singed off, the skin and flesh torn away in several places, with an expression as if the spirit had passed away in agony. Going with a single guide, we encountered two men, one with a light, the other bearing something on his shoulders. It was a blackened mass—a poor dead burned boy he was taking out. A little further on, we found wagons that had been loaded, overturned, bottom upwards, scattered in different directions; a horse lying dead, directly in the passage, with his head turned over his shoulder, as if, in falling, he had made a last effort to escape; he was swollen in an extraordinary manner. At one point, in another passage, we suddenly came amongst twelve or fifteen men, who, striving to reach the places where bodies or survivors might be found, had been driven back by the surcharged atmosphere of this vast common grave; their lamps were burning dim and sickly, with a dying red light, glimmering as if through a fog."

How, then, are these dread casualties to be prevented? Firstly, the miner has been furnished with a lamp, with the flame so shielded that it cannot come in contact with the dangerous atmosphere; secondly, the foul air has been swept away by ventilation; and, lastly, it has been proposed chemically to decompose the noxious gases, and thus prevent explosion. Of the two first methods, we shall immediately speak; of the last, suffice it to say, that although Mr. Blakemore has offered, through the Royal College of Chemistry, a premium of 1000*l.* for the discovery of some simple practical means by which the explosive gases may be decomposed or neutralized, still science has as yet been unable to obtain this desirable object.

Many safety-lamps have been proposed, but, as our readers know, the favorite has been that of Sir Humphrey Davy. Some practical miners, indeed, prefer the lamps of Dr. Clanny and of Stephenson; but as these are used in few collieries, we will confine our remarks to the Davy lamp. Its illustrious author, after a visit to the Newcastle coal-mines in 1815, began a series of beautiful experiments on the properties and structure of flame. From these he was led to conclude, that it could not pass through minute metallic tubes, and therefore wire-gauze, consisting of a congeries of these tubes, was a safe prison

wherein to confine it: a miner, therefore, with a lamp whose flame was thus separated from the explosive atmosphere, could pursue his avocation in perfect safety. In every chemical hand-book there are noted many striking experiments regarding this peculiar property of wire-gauze; and in the new caloric engine, the heated air is cooled and conducted into the regenerator by means of this substance. Nothing can be more beautiful in theory than Sir Humphrey's instrument, and in the laboratory or the lecture-room it truly seems perfect. All praise and honor to the intellect that labored so well for the service of humanity; and let the commendations of the many it has saved from destruction, and the many more it has redeemed from penury, be the everlasting monument of their noble benefactor! But let us beware of even scientific idolatry. And let us not take for perfect, that which even its inventor pronounced in some degree faulty. Be it always remembered, that the mine presents conditions often totally different from those of the quiet laboratory of the chemist. In a still atmosphere, radiation will destroy the flame ere it has time to pass through the wire-gauze. But should there be also a current of air at the time, its operations may be counterbalanced, and there is then no security. Moreover, particles of carbon, oil, dust, sulphur, are always floating about the mines and lodge themselves on the Davy lamps. The wire-gauze then red-hot, and the lamp in such a state, explosion is almost inevitable. So dirty are the lamps often, after being brought up from work, that one of the witnesses says "no practical man would go into an explosive mixture with them." This being the case, we can well sympathize with another witness, who thinks "it a safe lamp in cautious hands, but lately I have got a little nervous about it."*



Were miners to receive proper instruction as to the nature and properties of the dangerous gases they constantly inspire—did they possess a staid, scientific deportment, instead of their noted recklessness, then we might trust them with this delicate scientific instrument. But all these they deplorably want. As it is, we must therefore believe with the committee, that "under circumstances of excitement, when danger is threatened, it is not improbably, far oftener than imagined, the very cause of the explosion which it was intended to prevent." Many instances are on record, where the explosion was alone traceable to the Davy. It was so at Wallsend, where, in 1835, 102 people were killed. For two days previous, they were working under red-hot lamps, the flame filling them to the top; and when these were afterwards examined by the coroner, they were found to be perfect—only, as if they had been intensely hot, and "had been passed through a smith's fire." The lamps found after the explosion at Haswell Mine, where 95 people were killed in 1846, were in a precisely similar state, and the catastrophe could be traced to no other source; as

* The cut above represents an improved lamp upon Davy's principle. It is a simple Davy lamp, with only one coat of wire-gauze, in order to diminish the light of the flame as little as possible. The wire-gauze is surrounded by a glass cylinder, and the air for feeding the flame passes in below through a range of holes in the oil vessel. The air next passes through one or more disks of wire-gauze, which are fastened above those holes, below the flame or wick. It then passes a small cupola of brass, which has a little orifice in its vertex, so that explosive gas is forced to the flame, and must burn. The wire-gauze disks, below the flame and the cupola, are for the prevention of a returning motion of the inflamed gas through the lower parts of the lamp. The gas being thus

were also several similar, though smaller accidents, happening only last year. Besides all this, we find that while, during the twenty years previous to the introduction of the Davy lamp, 679 lives were lost, the number was increased to 744; thus leaving a balance against the safety-lamp of 65 lives. This may be accounted for by the increased extent of works, and greater number of mines; but every witness concurred in stating, that the recent fearful increase of accidents could not be thus explained.

Who can wonder, then, at the general adoption of the opinion, that to get rid of the gas altogether is preferable to guarding against it? The evidence now before us testifies, that however our leading mining engineers and capitalists may differ as to the method, they all consider ventilation as the sheet-anchor of the safety of the mines. The committee whose labors we have been considering, have principally occupied themselves in investigating the merits of the two rival systems of ventilation—the furnace and the steam-jet: we have not now the space, even had we the inclination, to follow them in their inquiries; suffice it to say, that while the furnace acts by rarefaction, the steam-jet acts in a strictly mechanical manner, propelling the air before it through the mine, like the piston of a steam-engine in the cylinder. The committee state that—"The furnace-system, under favorable circumstances—that is, of the area of the shafts being large and deep, the air-courses sufficient, the goves (or old workings) well insulated, and the mine not very fiery—appears to be capable, with strict attention, of producing a current of air that will afford reasonable security from explosion; but when the workings are fiery and numerous, as well as remote, and the intensity of the furnace or furnaces requires to be raised, in order to increase, in any particular emergency, the amount of ventilation, then the furnace not only refuses to answer the spur and to increase ventilation, but from a natural law (discovered by Mr. Gurney, and scientifically and practically confirmed before your committee) there arises a dangerous stoppage to the ventilation going on throughout the mine. . . . . Your committee are unanimously of opinion, that the steam-jet is the most powerful, and at the same time least expensive, method of ventilation for the mines. Previous to 1848, when Mr. Foster introduced the steam-jet into the Seaton Delaval Mine, the fire-damp was constantly seen playing around the face and edges of the goves and other parts of the workings. Since that period, the mine is swept so clean, that it is never observed, and all danger of explosion seems removed in a very fiery mine. The increase of ventilation is from 53,000 cubic feet per minute under the furnace-system, to 84,000 under the steam-jet; and to double that quantity, which Mr. Foster considers sufficient, would, he says, only require the application of some extra jets. Mr. Foster states the original outlay for the steam-jet to be less than for the furnace by 39*l.* 15*s.* 6*d.*; and the annual cost to be less by 50*l.* 12*s.* 1*d.*; while the power of ventilation is increased nearly double."

Additional inspectors, increased power vested in them, a central board of control, mining-schools, a special coroner, a preliminary examination of managers and over men, and the other topics touched on, all invite comment, but we forbear; and that the more willingly, since Lord Palmerston has stated that he may perhaps be able, this session, to introduce a bill on the subject. Let us hope that he may do so, and thus a little time will be spared from polemical discussions and devoted to the cause of practical humanity.

---

completely burned before it reaches the surrounding cylinder of wire-gauze, cannot extend to the air around. The access of more air to the wick than the wire cylinder can conduct, is prevented by the small holes in the bottom of the lamp and the glass cylinder; this hinders the lamp from getting filled with flame, which is the case when only a single coat of wire surrounds the flame. The glass cylinder is held down by a brass cupola, which is provided with some holes for the escape of the hot and burnt gas.

ART. II.—THE MINES AND MINERAL RESOURCES OF AMERICA.

NO. II.

To W. J. TENNEY, *Editor of the Mining Magazine :*

Having presented, in the last number of the Mining Magazine, the outlines of the mineralogical character of the New England States, with a view to call the attention of the student of geology and the practical miner to the abundance of mineral wealth known to exist in those States, and desiring its speedy development, I will now proceed to state facts connected with the existence of mines and minerals in the Middle and Southern States, commencing with the State of

NEW-YORK.

The first mineral I shall notice is the primitive or black oxide of iron, at Brewster's Station, in Putnam county. This is an ore of the ordinary black oxide of iron, which produces a fair yield of iron by the blooming process. It may be 50 per cent., as stated; but I fear this is an over estimate. By analyses, selected pieces, very pure, have yielded 79 per cent. This ore is very abundant, extending through the States of Maryland, Pennsylvania, New Jersey, New-York, Connecticut, Massachusetts, and Vermont, into Canada. In Washington, Franklin, Jefferson, Essex, Clinton, Westchester, and Putnam counties, in the State of New-York, it is inexhaustible for all future time. Although expensive in its reduction, it possesses qualities necessary to make a fair article of steel. It is very uniform in character from the shores of the Atlantic to the Pacific Ocean.

There is also an abundance of hematite ore in the towns of Amenia and Ancram, of the same character as the celebrated Salisbury iron of Massachusetts. Lead ore, highly argentiferous, also occurs in several localities in Dutchess county. Amongst the most prominent are the Amenia and Ancram mines. The latter was formerly worked by Colonel Livingston with success; subsequently the mine has passed through several hands without producing any result; but I am informed it is at present presenting an encouraging aspect. At this location is found ancramitic or green oxide of zinc. It is an artificial production, and was discovered in the bottom of an old furnace erected in the year 1744. According to Professor Silliman, this new ore is cadmia. Sulphate of barytes, pyritous copper, black copper, sulphate of iron, molybdate of lead, and sulphate of zinc, are also found at the Ancram mines.

Hematitic iron ore is abundant in the town of Putnam, a little to the south of Ticonderoga. Marl occurs in several locations in

New-York; among the most prominent are Boker's Falls, Bethlehem, Catskill, Clinton, Coeymans, Hilderburg, North-East, Rhinebeck, Dutchess county, and in Saratoga, Ulster, and Washington counties. Little doubt can be entertained that these deposits of marl are to be brought into use by the agriculturist, as most of them possess, in an eminent degree, the fertilizing principles necessary to aid the growth of vegetation. There are many bogs containing excellent peat, not unlike the Irish turf, which is susceptible of being made a very superior article of fuel; but I doubt if it will ever be worked successfully for tallow, oil, soda, pyroligneous acids, or any of the ingredients that have been extracted from the Irish *peat.** The following are among the most desirable localities: Canaan, Clinton, and the towns of North-East, Washington Hollow, and Rhinebeck, in Dutchess county, as well as many other places in the river counties. I am inclined to believe that this substance, properly prepared, where it is not underlaid with marl, may be used in the reduction of the hematite ores to advantage.

Iron Ore.—As this ore is the most abundant mineral and its use almost universal, it may not be out of place to notice some of its important localities in the State of New-York. At Bethlehem, hematite and bog ores are found; at Calais, black oxide of iron; at Canajoharie, hematite. On the west side of Lake Champlain, in Washington, Essex, Clinton and Franklin counties, is found, in unlimited quantities, magnetic oxide of iron existing in gigantic mountains and in veins and beds, from one to twenty feet thick; also, specular oxide of iron, iron sand, red hematite, red oxide and brown hematite. At Catskill, specular iron ore is found; at Cold Spring, magnetic iron and iron sand; at Guilderland, bog ore; at the Highlands, magnetic oxide of iron; at Hillsdale, hematite ore; at Malone, black oxide of iron; at Lyons, Wayne county, argillaceous oxide of iron; at Monroe, Orange county, black oxide of iron, very abundant (octahedral iron); at New Lebanon, hematite; at New-York city and island, large beds of bog ore, containing large quantities of manganese; the oxide of manganese is contained in hollow and friable pebbles, very pure; red oxide of iron and green phosphate of iron at Staten Island; black oxide of iron, hematitic iron and chromate of iron in Oneida and Ontario counties, likewise lenticular iron ore, in immense beds, and also in Madison county. Scaly red oxide of iron occurs along the shore of Lake Ontario; and in Saratoga, magnetic iron, hematitic iron, and magnetic oxide, lenticular, argillaceous oxide of iron; in fact, almost every town in the county has work-

* See Kane and Upjohn's report on value of Irish peat, to House of Lords, &c. 1846.

able veins or beds of iron ore. Lenticular, argillaceous oxide of iron is found, also, in the town of Vernon; arsenical iron in the town of Warwick ; granulated oxide of iron at West Point ; lenticular argillaceous oxide of iron occurs in the town of Williamson and at Carthage, Jefferson county. In Hamilton, Montgomery, St. Lawrence and Lewis counties, ores of iron, in great abundance and purity, exist in the vicinity of dense forests capable of furnishing fuel of the best kind, with water powers of vast magnitude sufficient to propel the machinery necessary for its reduction. As the coal fields of England, Scotland, and Wales, are giving out, may we not hope soon to hear the forests of Northern New-York, resound with the note of preparation to make the hidden treasures of the earth subservient to man, and thus for ever shut out the pauper product of the Old World ? For whilst the English landed proprietors refuse to use our sugar and our cotton because it is the product of slave labor, we consent to use their iron, produced by a system of slavery that would make the iron itself sweat drops of blood were it possible.

Lead ores are found in the following localities ;—Cambridge, Canaan, Canajoharie, Carlisle, Catskill, Claverack, Florida and Greenbush. In Lewis county near the village of Martinsburg there is an extensive lead and zinc mine of great value, and which cannot fail to be renumerative to parties working the same. It is on the estate of a Mr. Arthur. Lead is found also at Rhinebeck, Salisbury, and Shawangunk Mountains. At the latter, the mine has been worked both for lead and zinc at intervals, but it is evident the vein is copper ; and it will eventually be worked successfully. At the Sing Sing silver mine, the vein is highly argentiferous, accompanied with masses and sheets of metallic silver. It was extensively worked by Sampson Simpson, Henry Remsen, Colonel James and others, from the year 1764 to 1776, when the smithy houses were removed by the Continental army to West Point. Valuable specimens of the metallic silver have been preserved by the heirs of Mr. Simpson. Lead also occurs in the towns of Vernon, Wawarsing, Westmoreland, White Creek, and in several other localities. So far as I am acquainted but six of the mines are now worked, one at Wawarsing, the Ulster lead and the Ancram mine, and one in Dutchess county near the residence of Judge Boker, but with what success the writer is unadvised ; also in the northern part of St. Lawrence county they are working "the Great Northern," formerly "the Rossie" lead mines, and the St. Lawrence Mining Company's mine, and I believe both companies are producing lead. Copper also occurs in several places in the State of New-York, of which the following are the most prominent ; at Shawangunk Mountains, the yellow sulphuret ; at Ancram, yellow sulphuret, and black oxide,

and green carbonate of copper ; at Canajoharie, green carbonate of copper ; and at Catskill Mountains, green carbonate or malachite of copper. Antimonial gray copper occurs near Keeseville in Clinton county ; at Florida there is green carbonate of copper ; also at Fort Lee, also at Salisbury, in Saratoga county. Green carbonate and yellow sulphuret of copper are found at Staten Island ; detached pieces of copper ore are frequently met with near Fort Tompkins. Sulphuret of copper exists near Ticonderoga ; copper is also met with in several places in Wawarsing and Mamakating valleys. At this time I am not advised of more than one copper mine worked in the State of New-York, and that is at Crown Point. It is worked by Messrs. Hammond & Co., but what results have been realized the writer is not informed.

Zinc ore occurs in several localities of which the following are the most prominent: Dutchess county; Columbia county; Ancram ; Wawarsing ; Shawangunk Mountains ; Martinsburg, Lewis county ; Verona and Westmoreland, Oneida county ; Canajoharie, Carlisle, Clinton near the College, Duphney, Florida, Highlands, Niagara Falls, and Rome. The above locations produce sulphate of zinc, and chromate and carbonate. Eventually they will be worked when the price of labor is reduced or the demand for lead increased.

Sulphate of barytes is found at nearly all the localities of lead and zinc ; also in the bed of the Genesee River near Rochester, and at Pillow Point in Jefferson county, near Sackett's Harbour ; also in the town of Smithville.

Manganese.—Occurs on Manhattan Island, Staten Island, at Ancram, and several other places in the State. Perhaps the most important locality is near Martinsburg, Lewis county.

Phosphate of Lime.—Many localities of this powerful fertilizer are known to exist in this State; the most important of these are at Crown Point, and Moriah, Essex county. They have been extensively worked. This mineral occurs in twenty-six different places. One of which is in Washington county ; one at Anthony's Nose, and one at Lake George, and in most of the magnetic iron mines in the State ; also at the Highlands, also on Manhattan Island. Phosphate of iron occurs also at West Point.

Gypsum.—This valuable mineral exists in many parts of the State. The following are amongst the most valuable localities : Near Cayuga Lake, Cherry Valley, Chittenango, Galway, Lewistown, Oneida Creek, on the shore of Lake Ontario, and below the falls on the Genessee River, at Rochester. In the absence of the phosphate of lime, gypsum seems to abound ; and in that part of the State where neither have been discovered, marl of a fine quality seems to have been abundantly supplied to fertilize

and aid the agriculturist in producing his crops. There are many lime formations suitable for agricultural purposes.

Coal.—This mineral has been found in many localities in this State, but not in workable quantities; and I believe it is now pretty generally conceded that the chances are very much against finding it in quantities. The following localities are the most promising: Sullivan county, Dutchess county near Poughkeepsie, Ancram, Bethlehem, Buffalo, Canajoharie, Clinton and Florida. Bituminous coal occurs near Genesee, Little Falls, Salisbury.

Precious Stones.—The following list comprises the precious stones of this State: jasper, agates, garnets, emerald.

Marbles.—Black marble occurs at Crown Point, also at Glenn's Falls; white marble at South Dover, and white calcareous spar at Pleasantville; all of which is a strong and durable building stone. Marble is also found at several places in Westchester county; also verd antique in Putnam county.

Mineral and Salt Springs.—These exist at Saratoga, Ballston, New Lebanon, Cherry Valley, and in Westchester county; Salina, Syracuse, Montezuma, Lenox, and in the town of Ellisburgh, Jefferson county, on the farm of Ezra Stearns, Esq. The waters are impregnated with salt, and present evidences of having been used before that section of the country was inhabited with the present race of people.

I hope to be able to continue the mineral resources of the State of New-York in your next number; but, before I take leave for the present month, allow me to make some remarks designed for the profession of which I claim to be an humble member. I have witnessed with regret a disposition on the part of many individuals to pluck prematurely the honors due to older members of a profession, which cannot be acquired in a day. Since the present renewed interest in mining has taken possession of the minds of the public, the clergyman has left his pulpit, the lawyer his briefs, the druggist his pills, and the shoemaker his wax, and before its odor has been exhaled by his contact with the disinfecting principles of the fresh air, he offers himself as a competent person to examine and report on mines, and take the direction and management of them. Thus the capital invested is often lost, and an unfavorable influence prematurely fixed in the minds of those who have lost their money.

In no pursuit is intelligence, judgment, and experience so requisite; and if duly exercised by those who have these qualities, the development of the mineral resources of the country will advance under the most favorable auspices.

(To be continued.)

ART. III.—MINERAL TRACT OF THE EAST TENNESSEE AND CHEROKEE COPPER MINING COMPANY.

Report of J. D. WHITNEY, *U. S. Geologist.*

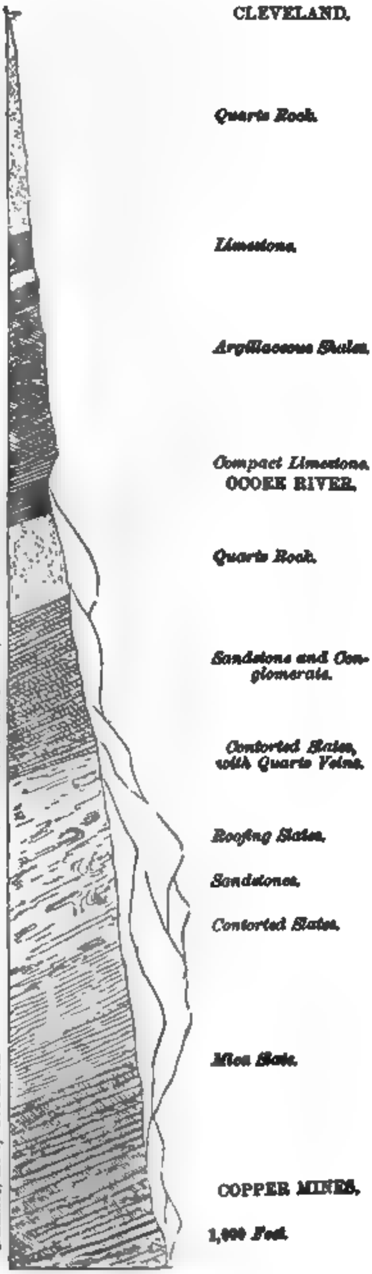
GENTLEMEN:—In reporting to you, as you request, upon the probable value of the Cherokee and Beaver Mining Property, in Polk county, Tennessee, I shall be obliged to give some account of the adjacent locations, on which more or less work has been done towards developing the character of the deposits of ore which occur in that region. Without doing this, it would be difficult to form an opinion, or give a clear idea of your property, on which, as yet, mining has hardly been commenced.

The copper region of Tennessee lies in Polk county, in the township occupying the extreme southeastern corner of the State, and known as Ducktown. This region is accessible, at present, for wheeled vehicles, only by way of Dalton, Ga., the point where the "East Tennessee and Georgia Railroad" unites with the "Western and Atlantic." This is about seventy miles distant from the mines, and the road is hardly passable during the wet season. To bring the mines nearer a market, a road is now constructing from Cleveland, Tenn., a station of the East Tennessee and Georgia Railroad, twenty-seven miles from Dalton, by which the amount of teaming will be reduced to about thirty-five miles. This road passes down the valley of the Ocoee, a rapid stream, hemmed in for several miles of its course by mountains of from a thousand to fifteen hundred feet in height. Not having the necessary instruments, I did not measure the height of the mines above the level of Cleveland, but the annexed section may be useful as giving an approximate idea of the route of the road, and the character of the rocks over which it passes.

On leaving Cleveland, we proceed east over a hard quartz-rock for about six miles, when we strike a bed of fossiliferous limestone, a few hundred feet wide; thence over argillaceous shales to the Ocoee River, where we again find limestone; this is distant about twelve miles from Cleveland. Here the road crosses the river, and it will be necessary to erect a bridge some four hundred feet long. The quartz-rock furnishes an admirable road-bed, and a very little care will keep it in excellent order. From the crossing of the river, we follow up its valley a distance of about twenty miles over the out-cropping edges of quartzose rocks, argillaceous shales and slates, and mica slates, all dipping to the east at a high angle, as shown on the section. Three or four miles of the most difficult portion of the route remain uncompleted, but it is believed that the whole road will be open for

use in September or October. It is not improbable that a railroad, connecting East Tennessee with South Carolina, may be built through the valley of the Ocoee, which would bring this region within a short distance of a market. At present the cost of transporting the ore to Dalton, by teams, is $15 per ton; thence to Savannah, by railroad, $9 50, making $24 50 per ton, to which the expense of shipping, &c., in Savannah, and freight to New-York, must be added. It is estimated that it will cost from $3 to $4 per ton to haul the ore to Cleveland after the new road is finished.

The whole of the region about the copper mines is heavily timbered with a variety of forest trees, but chiefly white-oak and other hard wood, such as is suitable for use in and about a mine, and for fuel. Wood may be furnished in unlimited quantity, at a low price, in case it should be thought best to erect smelting works. Water is abundant, small streams or branches flowing through the valleys, and furnishing good water-power in numerous localities. The Ocoee River is capable of supplying power to any amount, as it is from three hundred to four hundred feet wide, and has a rapid fall. The surface of the township in which the copper mines are situated is crossed by numerous ridges, which run with considerable regularity N. 20° E., S. 20° W., and have a height above the valleys of from one hundred to one hundred and



SECTION FROM CLEVELAND, TENN., TO COPPER MINES.
Distance, thirty-five miles.

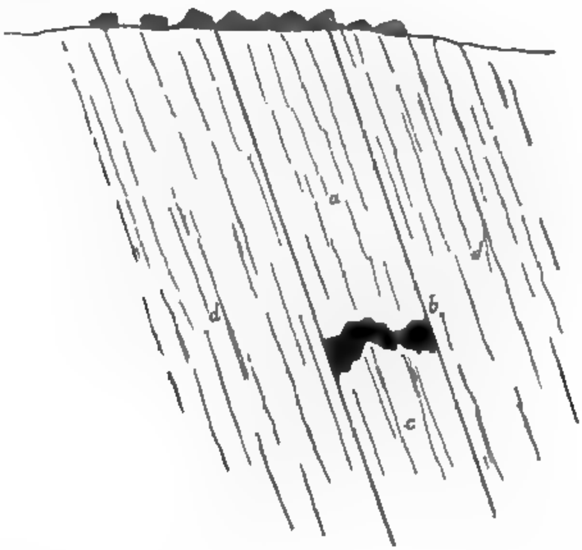
fifty feet. The lines of the public surveys have been laid out to conform to this direction of the valleys, which is itself dependent on that of the rocky strata, of which the strike throughout this whole country is in general very uniform and regular.

The rocks at the mines are micaceous and chloritic slates, probably of Silurian age, but so metamorphosed as not to be referable to any subdivision of that system. As we rise from Cleveland, we pass in succession over rocks becoming more "primitive" in their appearance, and losing their original sedimentary character, and finally becoming a well-characterized micaceous slate, containing garnets and other crystallized minerals common to that rock. It should be remembered that in this direction we are approaching the great Apalachian chain, which attains a few miles east, in North Carolina, a height greater than any where else in its course. The geological formations are therefore favorable to the development of mineral veins on an extensive scale.

There are two great veins, or beds, stretching through the township, preserving very nearly their parallelism throughout their course, as far as this has been observed. These two veins, which are about a half a mile from each other, and have the same course as the slate in which they are inclosed, which is, for the greater part of the distance, N. 20° E., S. 20° W. Near the line, they bend and assume a course nearly N.E. and S.W. This course they preserve as far as the town-line, when they appear to bend around again to the north, so as to assume their original direction. I was unable, however, to trace either vein for any considerable distance north of the town line, but the direction of the slate a short distance north of the northwest corner of the London Company's tract, was found to be N. 5° W., from which it may be inferred that the vein will have this direction, if it can be traced.

Throughout the whole extent of their course, as far as observed, these two veins present a remarkable uniformity of appearance; and, as far as can be judged from surface indications, they are so much alike that it is impossible to say which is the most valuable. Only one, however, has been opened to any extent. This is the west one. On this are two or three mines, opened to some eighty or ninety feet in depth. The appearance of the veins on the surface is marked by a heavy out-crop of *gossan* (the Cornish term for the hydrated oxide of iron, which results from the decomposition of pyritiferous ores). This outcrop occurs chiefly along the ridges, and the ground appears thickly covered with masses of ferruginous material, over a width, in some places, of at least a hundred feet. On penetrating beneath the surface, the section represented in the annexed

figure is obtained. Beneath the *gossan* is found a bed or mass of black cupriferous ore, of variable thickness and width. This, as well as the *gossan*, is the result of the decomposition of an ore consisting originally of a mixture of the sulphurets of iron and copper, which was associated with a quartzon gangue or vein-stone. The place of the bed of copper ore marks the limit of the decomposition of the vein; beneath it the ore exists in



SECTION OF THE VEIN.

(*a*) *Gossan.* (*b*) *Black Copper Ore.* (*c*) *Undecomposed Vein.* (*d*) *Mica Slate.*

its original condition. The depth to which decomposition has extended is variable, as it is identical nearly with the level at which water is found. On the ridges it varies from eighty to ninety feet in the excavations which have been made thus far; in the valleys it is nearer the surface, probably not more than thirty feet below it on the average. This black ore of copper is analogous to the "copper smut" or "Rupper schwarz" of the Germans, and is a common product of decomposition of cupriferous ores, though I have never seen it exhibited on so large a scale in any other locality. It is a mixture of black oxide of copper with sulphuret of the same metal, and some silicious or earthy matter. There is, also, considerable sulphuret of iron in crystals and small fragments scattered through it, as well as some sulphate of copper, and perhaps a little manganese. The thickness of this deposit of copper ore is very variable: in some places it forms conical masses of several feet in height; in

others it becomes very thin. From this circumstance, as well as the fact that in the excavations which have been made, the decomposed rock soon becomes covered with a black coating of oxide of copper, and also from the peculiar way in which the mines have been opened, it becomes difficult to estimate the thickness of the body of ore. I think, however, that it cannot fall below two feet. The thickness of this deposit cannot be taken as a guide to the quantity of copper pyrites which existed in the vein, when compared with the body of *gossan* which overlies it, as a large portion of the copper has been carried away and lost in the form of the sulphate, a soluble salt of copper. The water which runs from the excavations in this ore is strongly impregnated with copper, and we observed that the iron tools of the workmen, in some instances, where they had been allowed to remain in contact with the water, had become coated with metallic copper.

The thickness of the veins is also in some degree a matter of conjecture. From the appearance of the outcrop, it is evident that it is very considerable. In the Hiwassee mine, the black ore is said to occupy a width of forty-five feet in one of the shafts, which was filled with water at the time of our visit. From the appearance of the outcrop, I should not doubt the correctness of this statement. There is, however, a good deal of decomposed slaty rock inclosed within the ore. As the excavations have not been carried across the bed of black ore, so as to show its whole width, any estimate of its width can hardly be considered as much better than a guess, though it may be pretty safely said that it will not fall below *ten* feet, in the average, of good ore. The per centage yield of this ore varies from fifteen to twenty-five per cent., and the average of that sent to market will probably be equal to 20 per cent. of copper. At these low estimates, it will be seen that the quantity of this kind of ore is very large, as it will give over 6,300 tons to the mile in length on the vein, a quantity equal in value, at present prices, to at least $750,000.

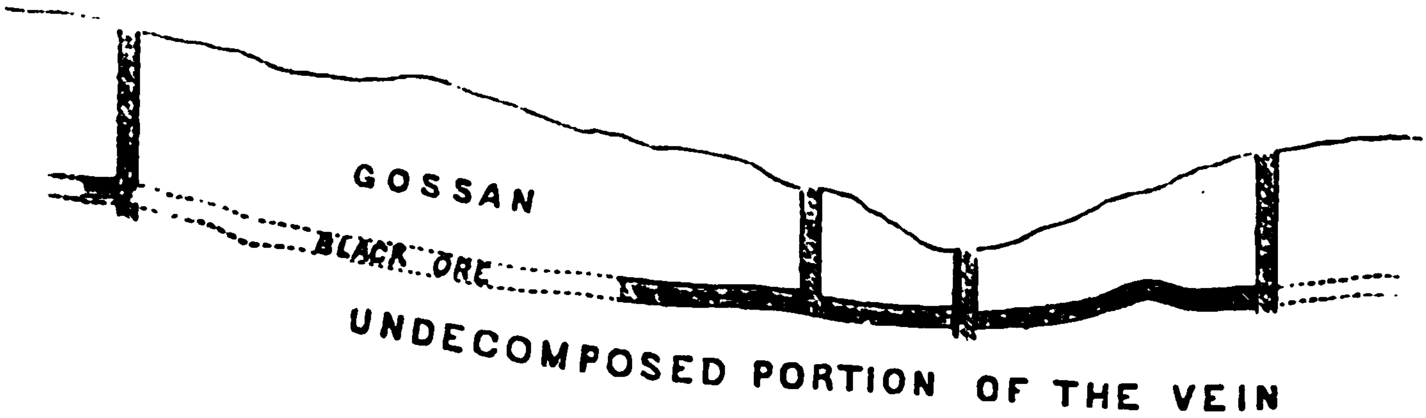
The facility with which this ore may be mined is to be borne in mind in estimating its value. Little or no blasting is required. Shafts sunk in the *gossan*, for the purposes of ventilation, need not be timbered, and the black ore can be taken out with the pick and shovel, and is so wide that several men can work abreast in the levels driven on it. The position of the ridges affords great facilities for driving in adit levels from the side, or transversely to the vein, through which the ore can be brought out to the surface.

Although in describing these deposits I have used the term "vein," I would remark that they must be understood as *contemporaneous* or *segregated* veins ; similar in their conditions, in

fact, to all the veins (so called) of the Southern States. They are, however, developed on so large a scale that there can be no doubt of their being continuous to a great depth, and reliable, although not true fissure veins.

There has been hardly any attempt made as yet to develope the veins below the line of decomposition. At the Hiwassee and Tennessee mines they have sunk a few feet in a hard quartzon gangue, with a good deal of iron pyrites, and some copper, but not enough of the latter, as yet, to constitute a workable ore. There is good reason to believe, however, that a proper exploration will reveal the existence of valuable bunches of copper pyrites, and to such an exploration the attention of the holders of property in this region should be directed, since, although the quantity of black ore which may be taken out with little expense and a large profit is very great, yet the time must come when it will be exhausted, and when the mines must depend for their permanent value on the development made in the pyritiferous ore in the solid portion of the vein.

The principal workings in which the knowledge of the character of these deposits have been obtained are on the locations of the Hiwassee and Tennessee Companies. Their situation will be seen by referring to the accompanying diagram. At each of the mines a few hundred tons of ore have been taken out, and a part of it shipped, but owing to the difficulty of transportation they will not probably be worked on a very extensive scale till the road is finished to Cleveland. The section on this page shows the extent of the workings at the Tennessee mines, and will serve to illustrate the position of the black ore. The mine is cleared of water by a small wheel driven by water power. The levels have been driven in the copper ore, but not so as to expose it in its full width, as a large portion of it has been left standing.



Scale 100 feet—1 inch.

LONGITUDINAL SECTION OF THE TENNESSEE MINE.

The *Cherokee Company's* location is the one next south of that of the Tennessee, and has the same vein extending through it for a distance of about three-quarters of a mile. The tract contains about four hundred acres. The outcrop of *gossan* is as well defined as any where on the vein, and appearances indicate that

the vein is as well developed on this location as on those further north. There are very favorable situations, where the work of mining can be carried on with small cost, by driving in levels on the side of the ridges at right angles to the course of the vein. Such a one has been commenced near a small saw-mill at the base of the ridge, and has been carried in about eighty feet, but not sufficiently extended to develope the character of the vein.

The *Beaver Company* has three-quarter sections, one south of the town line, and the remainder north. Just at the north line of the Cocheco tract, and but a few roods from the Beaver property, some excavations have been made with a view to proving the deposit, but have been abandoned, owing to some litigation with regard to the title. Some excellent black oxide was found near the small stream, almost at the surface. The outcrop is very heavy indeed at this point, and indicates that the vein is fully as wide as it is farther south. The vein keeps its northeasterly course across this quarter section of the Beaver Company, and touches the corner of the London Company's location, where a small opening has been made in the valley. Although no outcrop was perceptible here, the excavations revealed the existence of the black ore, though in what quantity it was impossible to ascertain, as the hole was full of water. The copper ore seems to lie quite near the surface at this extremity of the vein.

From this point north, I was unable to trace the outcrop of the vein with distinctness, but it may probably be found with a little costeaning. The course of the formation gradually changes to north, and then becomes west of north, and I presume that the vein keeps the same direction as the formation.

The great obstacle to the development of these mines lies in their distance from a market, and the consequent expense of freight on the ore, as well as the delay attendant on its transportation. This difficulty may be in no small degree obviated by the erection of a suitable furnace, which shall take the ore from all the mines and bring it up to a sixty or seventy per cent. regulus. In view of the quantity of the ore, and the abundance of fuel, this would be without doubt a safe investment for any independent company desirous of embarking in such a speculation. These mines would then stand about on a par with the Lake Superior mines, as far as the facilities for transportation are concerned, as they would be shipping a product of about the same per centage of copper, and at about the same expense.

In the foregoing statements I am aware that I have estimated the quantity of the black copper ore as somewhat lower than those by whom the mines have been worked, but in the difficulty of making an exact estimate I have preferred to keep below rather

than go above what the product may very possibly be. There can be no question of the great value of these properties, but exactly how much that value is, remains to be determined by future developments.

I remain

Very respectfully,

Your obt. Servt.,

J. D. Whitney.

New-York, May 30, 1853.

Art. IV.—REMARKS ON THE ORIGIN OF COAL-FIELDS, AND THE TIME REQUIRED FOR THEIR FORMATION.—By Sir Charles Lyell, F.R.S., V.P.G.S., &c.*

Sir Charles next proceeded to explain his views as to the origin of coal-fields in general, observing that the force of the evidence in favor of their identity in character with the deposits of modern deltas has increased in proportion as they have been more closely studied. They usually display a vast thickness of stratified mud and fine sand without pebbles, and in them are seen countless stems, leaves, and roots of terrestrial plants, free for the most part from all intermixture of marine remains, circumstances which imply the persistency in the same region of a vast body of fresh water. This water is also charged like that of a great river with an inexhaustible supply of sediment, which had usually been transported over alluvial plains to a considerable distance from the higher grounds, so that all coarser particles and gravel were left behind. On the whole, the phenomena imply the drainage and denudation of a continent or large island, having within it one or more ranges of mountains. The partial intercalation of brackish water-beds at certain points is equally consistent with the theory of a delta, the lower parts of which are always exposed to be overflowed by the sea, even where no oscillations of level are experienced.

The purity of the coal itself, or the absence in it of earthy particles and sand throughout areas of very great extent, is a fact which has naturally appeared very difficult to explain, if we attribute each coal-seam to a vegetation growing in swamps, and not to the drifting of plants. It may be asked how during river inundations capable of sweeping away the leaves of ferns, and the stems and roots of Sigillariæ and other trees, could the waters fail to transport some fine mud into the swamps? One genera-

* From Proceedings Royal Soc. of Great Britain, March, 18, 1853

tion after another of tall trees grew with their roots in mud, and after they had fallen prostrate and had been turned into coal were covered with layers of mud (now turned to shale), and yet the coal itself has remained unsoiled throughout these various changes. The lecturer thinks this enigma may be solved, by attending to what is now taking place in deltas. The dense growth of reeds and herbage which encompasses the margins of forest-covered swamps in the valley and delta of the Mississippi, is such, that the fluviatile waters in passing through them are filtered and made to clear themselves entirely before they reach the areas in which vegetable matter may accumulate for centuries, forming coal if the climate be favorable. There is no possibility of the least intermixture of earthy matter in such cases. Thus in the large submerged tract called the "Sunk Country," near New Madrid, forming part of the western side of the valley of the Mississippi, erect trees have been standing ever since the year 1811–12, killed by the great earthquake of that date; Lacustrine and swamp plants have been growing there in the shallows, and several rivers have annually inundated the whole space, and yet have been unable to carry in any sediment within the outer boundaries of the morass.

In the ancient coal of the South Joggins in Nova Scotia, many of the underclays show a network of Stigmaria roots, of which some penetrate into or quite through older roots which belonged to the trees of a preceding generation. Where trunks are seen in an erect position buried in sandstone and shale, rooted Sigillariæ or Calamites are often observed at different heights in the enveloping strata, attesting the growth of plants at several successive levels, while the process of envelopment was going on. In other cases there are proofs of the submergence of a forest under marine or brackish water, the base of the trunks of the submerged trees being covered with serpulæ or a species of spirorbis. Not unfrequently seams of coal are succeeded by beds of impure bituminous limestone, composed chiefly of compressed Modiolæ with scales and teeth of fish, these being evidently deposits of brackish or salt water origin.

The lecturer exhibited a joint of the stem of a fresh water reed (*Arundinaria macrosperma*) covered with barnacles, which he gathered at the extremity of the delta of the Mississippi or the Balize. He saw a cane-brake (as it is called in the country) of these tall reeds killed by salt water, and extending over several acres, the sea having advanced over a space where the discharge of fresh water had slackened for a season in one of the river's mouths. If such reeds when dead could still remain standing in the mud with barnacles attached to them (these crustacea having been in their turn destroyed by a return of the river to the same

spot), still more easily may we conceive large and firmly rooted Sigillariæ to have continued erect for many years in the carboniferous period, when the sea happened to gain on any tract of submerged land.

Submergence under salt water may have been caused either by a local diminution in the discharge of a river in one of its many mouths, or more probably by subsidence, as in the case of the erect columns of the Temple of Serapis, near Naples, to which Serpulæ and other marine bodies are still found adhering.

Sir Charles next entered into some speculations respecting the probable volume of solid matter contained in the carboniferous formation of Nova Scotia. The data he said for such an estimate are as yet imperfect, but some advantage would be gained could we but make some slight approximation to the truth. The strata at the South Joggins are nearly three miles thick, and they are known to be also of enormous thickness in the district of the Albion Mines near Pictou, more than one hundred miles to the eastward. There appears therefore little danger of erring on the side of excess, if we take half that amount, or 7500 feet, as the average thickness of the whole of the coal measures. The area of the coal-field, including part of New Brunswick to the west, and Prince Edward's Island and the Magdalen Isles to the north, as well as the Cape Breton beds, together with the connecting strata which must have been denuded or must still be concealed beneath the waters of the Gulf of St. Lawrence, may comprise about 36,000 square miles, which with the thickness of 7500 feet before assumed, will give 7,527,168,000,000 cubic feet (or 51,136·4 cubic miles) of solid matter as the volume of the rocks. Such an array of figures conveys no distinct idea to the mind; but is interesting when we reflect that the Mississippi would take more than two million of years (2,033,000 years) to convey to the Gulf of Mexico, an equal quantity of solid matter in the shape of sediment, assuming the average discharge of water in the great river to be, as calculated by Mr. Forshey, 450,000 cubic feet per second, throughout the year, and the total quantity of mud to be, as estimated by Mr. Riddle, 3,702,758,400 cubic feet in the year.*

We may, however, if we desire to reduce to a minimum the possible time required for such an operation (assuming it to be one of fluviatile denudation and deposition), select as our agent, a river flowing from a tropical country, such as the Ganges, in the basin of which the fall of rain is much heavier, and where nearly all comes down in a third part of the year, so that the river is more turbid than if it flowed in temperate latitudes. In reference

* See Principles of Geology, 8th ed., p. 19.

to the Ganges, also, it may be well to mention, that its delta presents in one respect a striking parallel to the Nova Scotia Coal-field, since at Calcutta at the depth of eight or ten feet from the surface buried trees and roots have been found in digging tanks, indicating an ancient soil now underground; and in boring on the same site for an Artesian well to the depth of 481 feet, other signs of ancient forest-covered lands and peaty soils have been observed at several depths, even as far down as 300 feet and more below the level of the sea. As the strata pierced through contained fresh-water remains of recent species of plants and animals, they imply a subsidence, which has been going on contemporaneously with the accumulation of fluviatile mud.

Capt. Strachey of the Bengal Engineers has estimated that the Ganges must discharge $4\frac{1}{2}$ times as much water into the Bay of Bengal, as the same river carries past Ghazipore, a place 500 miles above its mouth, where experiments were made on the volume of water and proportion of mud by the Rev. Mr. Everest. It is not till after it has passed Ghazipore, that the great river is joined by most of its larger tributaries. Taking the quantity of sediment at one-third less than that assigned by Mr. Everest for the Ghazipore average, the volume of solid matter conveyed to the Bay of Bengal would still amount to 20,000 millions of cubic feet annually. The Ganges therefore might accomplish in three hundred and seventy-five thousand years the task which it would take the Mississippi, according to the data before laid down, upwards of two million years to achieve.

One inducement to call attention to such calculations, is the hope of interesting engineers in making accurate measurement of the quantity of water and mud discharged by such rivers as the Ganges, Brahmapootra, Indus, and Mississippi, and to lead geologists to ascertain the number of cubic feet of solid matter, which ancient fluviatile formations, such as the coal-measures, with their associated marine strata, may contain. Sir Charles anticipates that the chronological results, derived from such sources, will be in harmony with the conclusions to which botanical and zoological considerations alone might lead us, and that the lapse of years will be found to be so vast as to have an important bearing on our reasonings in every department of geological science.

A question may be raised, how far the coöperation of the sea in the deposition of the carboniferous series might accelerate the process above considered. The lecturer conceives that the intervention of the sea would not afford such favorable conditions for the speedy accumulation of a large body of sediment within a limited area, as would be obtained by the hypothesis before stated, namely, that of a great river entering a bay in which the waves,

currents, and tides of the ocean should exert only a moderate degree of denuding and dispersing power.

An eminent writer, when criticising, in 1830, Sir Charles Lyell's work on the adequacy of existing causes, was at pains to assure his readers, that while he questioned the soundness of the doctrine he by no means grudged any one the appropriation of as much as he pleased of that "least valuable of all things, past time." But Sir Charles believes, notwithstanding the admission so often made in the abstract of the indefinite extent of past time, that there is, practically speaking, a rooted and perhaps unconscious reluctance, on the part of most geologists, to follow out to their legitimate consequences the proofs, daily increasing in number, of this immensity of time. It would therefore be of no small moment, could we obtain even an approach to some positive measure of the number of centuries which any great operation of nature, such as the accumulation of a delta or fluviatile deposit of great magnitude may require, inasmuch as our conceptions of the energy of aqueous or igneous causes, or of the powers of vitality in any given geological period, must depend on the quantity of time assigned for their development.

Thus, for example, geologists will not deny that a vertical subsidence of three miles took place gradually at the South Joggins, during the carboniferous epoch, the lowest beds of the coal of Nova Scotia like the middle and uppermost consisting of shallow-water beds. If then this depression was brought about in the course of three hundred and seventy-five thousand years, it did not exceed the rate of four feet in a century, resembling that now experieneed in certain countries where, whether the movement be upward or downward, it is quite insensible to the inhabitants, and only known by scientific inquiry. If, on the other hand, it was brought about in two million of years, according to the other standard before alluded to, the rate would be only six inches in a century. But the same movement taking place in an upward direction, would be sufficient to uplift a portion of the earth's crust to the height of Mont Blanc, or to a vertical elevation of three miles above the level of the sea. In like manner, if a large shoal be rising, or attempting to rise, in mid-ocean at the rate of six inches or even four feet in a hundred years, the waves may grind down to mud and sand, and readily sweep away the rocks so upraised, as fast as they come within the denuding action of the waves. A mass having a vertical thickness of three miles might thus be stripped off in the course of ages, and inferior rocks laid bare. So in regard to volcanic agency, a certain quantity of lava is poured out annually upon the surface, or is injected into the earth's crust below the surface, and great metamorphic changes resulting from subterranean heat

accompany the injection. Whether each of these effects be multiplied by fifty thousand, or by half a million, or by two million of years, may entirely decide the question whether we shall or shall not be compelled to abandon the doctrine of paroxysmal violence in ancient as contrasted with modern times. Were we hastily to take for granted the paroxysmal intensity of the forces above alluded to, organic and inorganic, while the ordinary course of nature may of itself afford the requisite amount of aqueous, igneous, and vital force (if multiplied by a sufficient number of centuries), we might find ourselves embarrassed by the possession of twice as much mechanical force and vital energy as we require for the purposes of geological interpretation.

Art. V.—REPORT OF THE MINNESOTA MINING COMPANY (LAKE SUPERIOR), FOR THE YEAR 1852.

It again becomes the duty of the Board of Directors, at the close of another business year, to communicate to the stockholders the progress that has been made under their management, in the prosecution of the company's mining operations since the last annual meeting, and the results that have been realized therefrom; together with a statement of the present condition of its financial affairs, and its general prospects for the ensuing year.

PRODUCT OF THE MINE.

It was stated in the last annual report, that the product of the Minnesota mine for the previous year (1851), was 307½ tons of mineral, being an average of about 25½ tons per month; the whole of which, however, for reasons stated in said report, was not forwarded to market before the close of the lake navigation, 183 tons remaining on hand at the mines on the first of January, 1852. The production of the *past* twelve months (that is, to January 1st, 1853), has been 523 tons—averaging about 43½ tons per month, and showing an increase of more than 70 per cent. over the production of the preceding year.

RECEIPTS AND PROCEEDS OF MINERAL.

The whole quantity on hand at the close of navigation last fall, we were again disappointed in getting to market, by reason of an unusual drought, and consequent lowness of water in the Ontonagon river, which deprived us of the only means of transportation (in the summer season), between our landing near the mine, and the shipping place at the mouth of the river. We succeeded, however in getting down 313 tons; which yielded,

when smelted, an average of about 74 per cent. of pure copper, being 2 per cent. more than the yield of the previous year's mineral. Of this quantity, we delivered at Detroit the proceeds of 150 tons in fulfilment of a previous contract of sale, on which we had obtained an advance of thirty thousand dollars to meet the company's deficiencies of 1851, caused by the failure in receipts, as before mentioned; and the balance of 163 tons, yielding 231,617 lbs. of ingot copper, was sold in this market, producing the sum of $49,269 05—or an average of about 21¼ cents per lb., being an advance of one cent per lb. on the price obtained the previous season. From the improving state of the market last fall, a considerably larger amount would have been realized from these sales, but for the fulfilment of another contract for 50 tons, also made in advance, as stated in last year's report, and delivered from the above receipts.

MINERAL ON HAND AT THE MINES.

The following statement will show the amount of mineral on hand at the mines on the first of January last, and also as estimated on the 1st of the present month, viz.:

Mineral on hand at the mines, Jan. 1st, 1852, ...	183	tons.
Ditto raised from Jan. 1st, 1852, to Jan. 1st, 1853, as per monthly returns.	523	"
	706	"
Forwarded from the mines in 1852, ...	313	"
Mineral on hand Jan. 1st, 1853, ...	393	"
Estimated product for January and February, 1853, . . .	100	"
Mineral on hand March 1st, 1853, ...	493	tons.

The greater part of this whole quantity is probably now at the mouth of the river, and ready for shipment by the earliest conveyance on the lake this spring, as—in order to avoid the possible recurrence of last year's disappointment as regards our transportation the coming season (though it may not happen again for years)—your Directors had caused a winter road of about twelve miles in length to be constructed last fall, by which the entire product of the present winter, as fast as raised, is being conveyed by teams to the mouth of the river, at an expense not exceeding the usual cost of summer transportation by the river itself when in boating order. The mineral left over at the landing last fall, is also being teamed down the river on the ice; and with the aid of several large flat-boats which are building against the opening of navigation this spring, we may expect to accomplish, beyond all reasonable doubt, the shipment of our entire production up to the beginning or middle of November next.

EXPENDITURES FOR THE YEAR.

The expenditures of the past year, for *all* purposes connected with the Company's operations, have been as follows, viz. :

For Wages at the mines, ...	$44,535 14
" Supplies, "	42,814 55
" Freights and charges, including Smelting, . . .	13,747 39
" Interest and Commissions, ...	7,307 29
" Personal Property, including new steam engine, .	6,450 70
" General expenses, including Salaries, Insurance, &c.	6,182 94
" Real Estate, ...	1,673 38
" Office rent and expenses, New-York, ...	432 97
Total expenditures in 1852, ...	$123,144 81

This entire amount, however, is not properly chargeable to the cost of *production* only for the past year. Deducting the items of interest, real estate and personal property, the actual *mining* expenses have been about $108,000—or an increase of 23 per cent. on those of the preceding year ; while the production of mineral for the same period has increased, as before shown, in a threefold ratio to the expenditure. The expenses of the past year have also been considerably augmented by the advanced prices of the leading articles of supplies, especially provisions, at the time our large purchases were made last fall for eight months ahead, as is necessarily the case from the length of the winter in that northern region.

TREASURER'S ACCOUNT.

The Treasurer's cash account, with the accompanying vouchers, have been duly audited and certified by the committee on accounts, and show his entire receipts and disbursements to have been as follows, viz. :

RECEIPTS.

Balance from last year's account, ...		$ 139 72
Bills and debts receivable collected, ...		20,510 17
Sales of Copper, ...		50,947 93
Proceeds of Silver coined at the U. S. Mint, ...		261 69
Bills payable discounted, ...		59,629 22
		$131,488 73
DISBURSEMENTS.		
Bills payable outstanding per last year's account, ...	19,733 74	
Amount paid Agent's drafts and for sundry accounts, as per vouchers No. 1 to 496,	110,790 47	
		130,524 21
Balance in Treasurer's hands, March 1st, 1853, ...		964 52

Our disappointment in the receipt of mineral last season, as before mentioned, left us to provide for a large amount of the Company's liabilities falling due the past winter and present

spring; and temporary loans being deemed by the Directors preferable, under the circumstances, to assessments on the stock, an arrangement was made for obtaining such advances as might be required until our copper could be brought to market. Hence the item of $59,629 22 of bills payable, or loans, appearing in the Treasurer's account; and the discount and commissions on which, together with those on the loans of last year (which also come into *this* year's account), will explain the large amount of our interest account. But severely as the disappointments which made these accommodations necessary were felt at the time, the delay in obtaining our copper has proved, nevertheless, a most fortunate occurrence for the interests of the stockholders; and the amount paid for interests and commissions on loans, will be abundantly compensated by the great advance in the market value of copper, the advantage of which we should have lost had our last season's product come into market in the usual course.

PROPERTY AT THE MINES.

The accounts and vouchers of Mr. Roberts, the Company's superintendent and agent at the mines, have been received and examined, showing the amount of indebtedness for wages, and the balance of cash on hand on the first of January last; also, an inventory of personal property belonging to the Company, and the amount of supplies on hand at the same date; together with an estimate of the value of our real estate (or surface) improvements, as exhibited in the following statement, viz.:

Personal Property, conisting of 2 Steam-engines, Stamping-mill, Saw-mill, Mining and Agricultural Tools, Machinery, 15 Horses, 4 yoke of Oxen, Wagons, Carts, Harness, Boats, Household Furniture, &c.	$26,041 00
Real Estate (or surface) Improvements, consisting of cleared Lands, Buildings, Roads, Docks, &c.,	25,789 00
Supplies on hand, at cost and charges,	27,775 00
Cash in Agent's hands, Jan. 1st, 1853,	2,394 84
	81,999 84
Deduct indebtedness of the Company on Wages Account, Jan. 1st, 1853,	29,949 53
Balance,	$52,050 31

From this statement it will be seen, that the amount of supplies (even at cost and charges) and of cash on hand at the mines on the 1st of January last, was more than sufficient to balance the Company's entire indebtedness there for wages account, leaving the whole of the personal property and real estate improvements, amounting to nearly $52,000, entirely clear; to say nothing of the mine itself, with all its extensive openings, and 1315 acres of mineral and agricultural land attached, the value

of which, as represented by its present and constantly increasing rate of productiveness, can hardly be estimated at less than ONE MILLION OF DOLLARS.

RESOURCES AND LIABILITIES.

From the foregoing accounts and statements the following schedule has been prepared, showing the resources and liabilities of the Company, and its general financial condition and prospects on the first day of the present month, that is to say:

RESOURCES.

Mineral on hand March 1st, 1853—493 tons, estimated to average 75 per cent. of pure copper, viz.:			
300,000 lbs. . . .	at 25 cents,		75,000 00
439,500 " . . .	" 35 "		153,825 00
Supplies on hand, at cost and charges, . . .			27,775 00
Debts Receivable, New-York, ...			11,005 88
Cash on hand at the mines, ...			2,394 84
Ditto " in New-York, ...			964 52
Total amount of Resources, . .			$270,965 24

LIABILITIES.

Bills and Debts payable, New-York, . .	83,980 59	
Wages due at the mines, Jan. 1, 1853, .	29,949 53	
Ditto estimated for January and February, .	17,000 00	
Cost of Freight, Insurance, and Smelting 493 tons Mineral, at $30 per ton, . . .	14,790 00	
		145,720 12
Surplus, ...		$125,245 12

The foregoing statement shows a balance of resources at the present moment equal to a dividend of more than $40 per share on the capital stock, and which of course will be increased by the production of the intervening period up to the commencement of lake navigation. The 300,000 lbs. estimated at 25 cents per lb. were sold in advance by the Directors, before the recent great and unexpected rise in the price of copper; and was considered at the time to be a desirable and advantageous sale for the Company. The remaining 439,500 lbs. are estimated at about the present market value, which is regarded as likely to be fully maintained for the current year. In fact, the Directors have declined for the present to make any further sales for future delivery, deeming it not improbable, from the aspect of the foreign as well as domestic market, that a further advance may yet be realized before delivery can be made the ensuing summer.

ESTIMATED PRODUCT FOR 1853.

In order to avail ourselves to the utmost of these favorable circumstances, our agent has been instructed to increase the force employed in the producing department as fast as additional

labor can be profitably applied. A new and powerful steam-engine was sent up last fall, and will shortly be in operation for hoisting and pumping purposes, thereby greatly facilitating the clearing of the mine, and the raising of the mineral. The quantity raised for several months past has averaged about 50 tons per month; and with the increased facilities thus afforded, a proportionate increase in production may be reasonably anticipated. At all events, we may very safely calculate upon a *sustained* production of 50 tons per month, at the lowest estimate; while in all probability it will reach if not exceed an aggregate of 750 tons for the next twelve months.

That this estimate is rather below than beyond the probable returns for 1853, will appear from the following table, showing the progressive increase and comparative cost of the Company's mining operations since their commencement in 1848, with the results realized from each year's business, viz.:

Year.	No. of Men.	Expenditure.	Mineral produced.	Net Value.
1848	20	$14,000	6¼ Tons.	$ 1,700
1849	60	28,000	52 "	14,000
1850	90	58,000	103 "	29,000
1851	175	88,000	307¼ "	90,000
1852	212	108,000	523 "	196,000
Total,	. .	$296,000	992 Tons.	$330,700

As to the present appearance of the mine in its different openings, the condition of the works in progress under his direction, and the prospective results thereby indicated in *his* opinion, Mr. Roberts in his January and February letters, writes as follows, viz.:

"The thirty-fathom level below the adit (that is, at the depth of 266 feet), is looking generally as well as the levels above. We have been driving the adit level east, and find a very good lode, producing some considerable masses. We are yet cutting up the large mass I formerly advised you of. It is very fine and pure copper, and very thick, some of the cuts measuring nearly three feet, and will require some two months yet to complete. We have copper enough *now down* in the mine, to keep up the average return of 50 tons for two or three months to come. We are also getting, to all appearance, another fine mass, east of No. 2 shaft, above the adit. The south lode has improved since last month, and we are now driving by some considerable sheets of copper. In the third level, we are driving west on a good lode, and have blown off a mass of two tons from the top of the drift, which holds strong at the bottom. We have also reached in thirty-fathom level east of No. 1 shaft, a lode that fills up the entire drift, being at least six feet thick, and we are now working around it south. These highly favorable indications in our lowest level, have removed all doubts as to the continuance of our mine in depth; and in fact, the whole mine, in *all* its openings, never looked better or more promising than at present."

GENERAL STATISTICS OF THE MINE.

The real estate of the Company, constituting its mining location, comprises 1315 acres of land, containing a large extent of mineral veins besides those we are now working, sufficient, it is estimated, for the most extended operations of the Company for a century to come. The mining works in progress consist of 4 main shafts, and 4 drifts or levels, with several cross-cuts; and the amount of underground work that has been done, is shown by the extent to which these shafts and drifts have been opened, viz.:

No. 1 Shaft is sunk to the depth of	266	feet.
No. 2 " " " "	267	"
No. 3 " " " "	260	"
No. 4 " " " "	217	"
Whole depth of Shafting, . . .	1010	"

Adit Level is driven to the extent of	1138	feet.
10 fathom do. " " "	1052	"
20 " do. " " "	753	"
30 " do. " " "	142	"
Cross-cuts " " "	460	"
Total length of Drifts	3545	"

The agricultural land attached to the mine is of fine quality, of which about 20 acres are cleared annually, and 100 acres are now under cultivation, producing hay, oats, potatoes, turnips, &c., in great abundance and perfection. The other surface improvements are extensive and valuable, and of a substantial character. Upwards of 70 buildings have been erected for the accommodation of our business, including 33 dwelling-houses, and a new and comfortable building designed and regularly occupied as a church and school-house. At the landing on the river we have a good dock and warehouse, with a road of two miles length to the mines, and a road from the latter to the lake, a distance of 12 miles. We have also 1200 feet of surface, and 1100 feet of underground railroad connecting the different shafts.

The population resident on our location at present, and sustained by the Company's operations, consists of 312 persons, viz.: 212 men and boys, and 100 women and children. Of the former, 173 are employed in the mine, and 39 on the surface. A qualified physician and surgeon resides in the settlement; and to show the unusual salubrity of the climate, notwithstanding its severity in winter, it may be mentioned that only one death has occurred there from disease since the Company commenced operations in 1848. Good order and sobriety are strictly maintained by the judicious rules and regulations enforced by the Company's agent, who says in a recent letter, "We have no policeman or

justice of the peace nearer than the lake (13 miles), and we make no calls upon them so far." He adds—"I think, could the Directors and Stockholders only visit us, they would feel a just pride in the appearance, condition, and general arrangement of their buildings and works, and a full reliance on the ultimate value of their property."

Your Directors have thus communicated all the information necessary to enable the Stockholders to form a just estimate of the value of their interests, both immediate and prospective, in the MINNESOTA MINING COMPANY; and also, of the manner in which its operations have been conducted during the past year, under the direction of this Board. The details thus given, and the results announced, they trust will be acceptable and satisfactory to all concerned—and they cannot but express their own gratification at the highly prosperous and successful condition in which they are enabled to exhibit the Company's affairs.

REORGANIZATION OF THE COMPANY.

It has been the wish of many of the Stockholders, for some time past, to increase the number of shares in the Capital Stock of the Company, and your Directors were about applying to the Legislature of Michigan for an amendment of their charter to that effect; but a new General Act having been passed at the recent session, more liberal in some of its provisions than the special charters heretofore granted, it has been proposed to *relinquish* the present charter altogether, and reorganize the Company under the new law, with a capital stock of $500,000, divided into 20,000 shares of $25 each. It is argued, that we have already expended more than our present capital; and that even the proposed increase (which is limited by the provisions of the Act) would not adequately represent the intrinsic value of the stock, based on the real and personal property of the Company, and the well-established character of their mine for richness, extent, and productiveness. Its ability to pay a dividend of $30 to $40 per share from the surplus already accumulated, with the assurance of a continued and constantly increasing product in future, will doubtless establish the character of the stock as a safe, profitable, and desirable investment under either organization.

Should the proposed plan be adopted, the new shares may be issued as full stock, and the whole nominal capital considered as paid in, since it is certain no further calls for assessment will be required. This will also materially benefit such of the Stockholders as may wish to realize on the sale of any portion of their shares, for which a price equivalent to their intrinsic value cannot be readily obtained with the small number of shares and inadequate *par* value prescribed by our present charter.

Your Directors are disposed to think favorably of this proposition, and the grounds on which it is urged, provided a dividend of the surplus now shown to be on hand from last year's business, shall first be declared for the benefit of the *present* Stockholders. The following statement will show the prospect for a *further* dividend from the production of the ensuing season up to the middle of November next, being the usual limit of navigation on the upper lakes, viz.:

Balance of resources on hand, March 1st, ...		125,245
Deduct proposed dividend of $30 per share, on 3000 shares, ...		90,000
		35,245
Estimated product of mineral from March 1st to Nov. 15th, is 8½ months, at 50 tons per month, = 425 tons, or 637,500 lbs. net, at 35 cents per lb., ...		223,125
		258,370
Estimated expenditures for 8½ months, at $9,000 per month, ...	76,500	
Freight, Insurance, and Smelting 425 tons mineral, at $30 per ton, ...	12,750	
		89,250
Estimated surplus, Nov. 15, 1853, ...		$169,120

Being fully 33 1-3 per cent. on $500,000 Capital, or over $8 per share on 20,000 shares.

The above calculation is based on the *minimum* estimate of product, and on the present market price of copper; but the probable increase of the former will leave sufficient margin for any possible decline that may take place in the latter.

It is a question for the Stockholders to decide, whether the advantages contemplated by the proposed change would justify the relinquishment of our present charter; and your Directors would recommend to this meeting an early consideration of the subject, with a view to such action as may be deemed expedient and advisable.

In conclusion, they would congratulate the Stockholders on the certainty of receiving a handsome dividend from the proceeds of last year's business, as soon as the mineral now on hand can be made available for that purpose (which they trust will be at an early day)—and also, on the highly favorable prospects of the Company for the ensuing year.

All of which is respectfully submitted.

JOHN C. TUCKER,
WM. PEARSALL, Jr.,
MOSES A. HOPPOCK, } DIRECTORS.
WM. E. DODGE,
WILLIAM HICKOK,

NEW-YORK, March 9, 1853.

ART. VI.—ELEMENTARY GEOLOGY.*

GEOLOGY is one of those sciences which lies close at hand, easy to be investigated in its elements by every passer by, and offering seductive allurements which can impress the most uninformed minds, yet it is too often overlooked. The reason of this is not to be found in the nature of the science itself, so much as in the conditions or circumstances under which it is presented; for whose eye has gazed upon the surface of the earth, and not detected a difference in the rocks at our feet? Their color, hardness, and stratified or unstratified character have been recognized by every one. Who does not know the appearance of quartz, and marble, and sandstone, and slate? This knowledge appertains to the elements of geology, and is common to all men. Enlarge it, embrace within its compass the important classes of rocks in which geologists have divided the masses found on the earth, describe the circumstances under which they are found, and their invariable incidents and attendants, and the glance has taken in the chief elements of the science. Then summon reason to your aid,—ask the origin of what has been seen—the manner of its formation—and the period of time required for such results; trace out the remains of those unknown orders of animals, and reptiles, and fishes, which are found converted into the material of their rocky sepulchre; seek to explore that system of creation or development bearing upon its front such distinct symptoms of having been broken up or thrown into confusion, and you have entered among the most profound and interesting speculations of this science.

It is not requisite for a practical knowledge of geology, to be acquainted with the details of every one of the five hundred and more of minerals into which the materials composing the earth have been classed. Scarcely more than eight or ten are of leading importance. These so predominate—they occupy such large portions of the earth in contrast with the remainder—that they command superior attention. We address those who have given little or no thought to this science. We would convince them that, by patient and gradual approaches, its entrances will prove easy and gratifying.

First of all minerals in extent is the quartz rock, which constitutes almost a half of the earth's crust. Its crystals are

* A Manual of Elementary Geology; or, the Ancient Changes of the Earth and its Inhabitants, as Illustrated by Geological Monuments. By Charles Lyell, M. A., F. R. S. Reprinted from the fourth and entirely revised edition. 8vo. pp. 512. New-York: D. Appleton & Co.

extremely hard, scratching glass, striking fire with steel, and more or less transparent. Its varieties and colors are numerous. It composes the transparent grains of granite and of sandstone, and is a principal part in the sand of which glass and mortar are made.

One of the next in importance is termed feldspar. It is not so hard or glassy in its appearance as quartz, but rather of a pearly lustre and whitish color. When decomposed, it forms a white clay, somewhat unctuous, called kaslin, which is used in the manufacture of fire-bricks, stoneware, porcelain, and pottery. The common clay consists of impure feldspar decomposed. It usually contains a small portion of iron—the protoxide—which by heat is converted into the peroxide, giving the red color to bricks and pottery.

Mica—often improperly called isinglass—is a glistening mineral, tough and elastic, and giving to rocks a silvery aspect. It occurs in thin plates, but chiefly in the form of scales; it is used in stoves, lanterns, &c. It forms from a fifteenth to a twentieth part of the earth's crust.

Limestone—known as the carbonate of lime—consists of numerous varieties, and composes from a sixth to an eighth of the crust of the earth. It is much softer than either feldspar or quartz. Marble belongs to those varieties which admit of a high polish. Marl, which is of great service in agriculture, is a pulverulent variety. Hornblende, another mineral occurring in granite instead of mica, or associated with it, is of a dark green color, and constitutes a large part of the rocks of volcanic origin, and of the older slates. It forms from a fifteenth to a twentieth part of the crust of the earth.

Talc is a very soft mineral, of a pearly lustre. It is the characteristic ingredient of soapstone, French chalk, and chlorite.

Serpentine, a green, opaque mineral, harder than limestone, gypsum or plaster, rock-salt, coal and iron ores, are the only other minerals forming any considerable portion of the earth's crust. It is true mineralogy recognizes numerous distinct mineral substances; but these are the only ones of prime importance in their extent.

Such are the elementary substances recognized as forming the great mass of that portion of the earth of which we know any thing. Let us observe them a little further.

These mineral masses, as they lie upon the earth, first attract the contemplation of the geologist. He observes that all appear under one of two forms; either in irregular masses of a crystalline nature, of in layers or strata. This is very correctly represented in the base of our title-page on the cover of this number. The rocks at the extreme left are the unstratified ones, consisting

of granite. The dark strips which project upwards through the mass, are intended to represent veins of quartz; while the mere lines projecting upwards in the same mass indicate metalliferous veins. Passing further to the right, the stratified rocks are represented, penetrated here and there by dikes or upshots from the trap rock beneath, and continued through the entire series to the last deposits at the base of the volcano.

Here the science of geology strictly commences. If the stratified rocks are met with in layers, nothing is more natural than that the lowest layers should have been first formed. Whenever sedimentary matter is deposited by water, it is found in layers, hence it is inferred that these strata have been generally spread out by the action of water. It is in these rocks that the petrified remains of beasts, and reptiles, and fishes are found, many of which are of a size and form unknown to the race of man. The other division of rocks, the unstratified, are devoid of such remains, and their origin is ascribed to the agency of fire.

Having gone thus far, the broad and ample fields of this science begin to spread out before us, tempting us to roam fearlessly amid its stupendous formations, or ponder the still more wonderful results deduced by reason from them. Here science, leading forth her pupil, points, on the one hand, to those "foundations which were laid of old;" and, on the other, to species of animals which have lived and become extinct, their remains embalmed in rocky sepulchres, like the last vestiges of life in former worlds.

But we must return to the object before us. If we have said sufficient to tempt the reader to pursue the subject, in the work of Sir Charles Lyell, one of the most accomplished geologists of the age, which has given rise to our reflections, our remarks will not have been amiss. The "Manual of Elementary Geology," of which a new edition has recently been put forth, with the latest additions and corrections of its accomplished author, is one of those valuable works which displays the charms of science in the most elegant and philosophical attire. Devoted as it is to elementary geology, or the ancient changes in the earth and its inhabitants, in contradistinction from those of the present day, it serves both to explain and unfold the great features of the science, and to notice some of the most important and practical points arising therefrom. Space will not permit us to speak in detail of its contents, or of the views advanced with much force and clearness of diction, or of the almost inexhaustible store of information its pages contain. It was our desire to make some extracts from the portion added to this edition, embracing some new facts on paleontology; but this is a subject, the chief interest of which will be recognized by those advanced in the knowledge of geology. There are, never-

theless, many passages more within the scope of this Magazine, which, if not quite so fresh, will have a more direct and practical interest with our readers.

With regard to the various theories which have been held in relation to the earth, that of "progressive" development is the one to which Sir Charles is decidedly opposed. He shows also the complete manner in which it is set aside by late discoveries. His own opinion is that of the stratified formation of the earth, each layer having its peculiar inhabitants, animate and inanimate.

Of the thirty-eight chapters into which the contents of the volume are divided, the one of chief interest with us is the last, which treats exclusively of "mineral veins." It commences with these truthful words: "The manner in which metallic substances are distributed through the earth's crust, and more especially the phenomena of those nearly vertical and tubular masses of ore called mineral veins, from which the larger part of the precious metals used by man are obtained,—these are subjects of the highest practical importance to the miner, and of no less theoretical interest to the geologist." After noticing the almost entire revolution which has taken place in the views entertained respecting metalliferous veins since the middle of the last century, our author proceeds to state the geological facts brought to light by mining operations; and first—

On different kinds of mineral veins.—Every geologist is familiarly acquainted with those veins of quartz which abound in hypogene strata, forming lenticular masses of limited extent. They are sometimes observed, also, in sandstones and shales. Veins of carbonate of lime are equally common in fossiliferous rocks, especially in limestones. Such veins appear to have once been chinks or small cavities, caused, like cracks in clay, by the shrinking of the mass, which has consolidated from a fluid state, or has simply contracted its dimensions in passing from a higher to a lower temperature. Silicious, calcareous, and occasionally metallic matters, have sometimes found their way simultaneously into such empty spaces, by infiltration from the surrounding rocks, or by segregation, as it is often termed. Mixed with hot water and steam, metallic ores may have permeated a pasty matrix until they reached those receptacles formed by shrinkage, and thus gave rise to that irregular assemblage of veins, called by the Germans a "stockwerk," in allusion to the different floors on which mining operations are in such cases carried on.

The more ordinary or regular veins are usually worked in vertical shafts, and have evidently been fissures produced by mechanical violence. They traverse all kinds of rocks, both hypogene and fossiliferous, and extend downwards to indefinite or unknown depths. We may assume that they correspond with such rents as we see caused from time to time by the shock of an earthquake. Metalliferous veins, referable to such agency, are occasionally a few inches wide, but more commonly 3 or 4 feet. They hold their course continuously in a certain prevailing direction for miles or leagues, passing through rocks varying in mineral composition.

That metalliferous veins were fissures.—As some intelligent miners, after an attentive study of metalliferous veins, have been unable to reconcile many of their characteristics with the hypothesis of fissures, I shall begin by stating the evidence in its favor. The most striking fact perhaps which can be adduced in its support is, the coincidence of a considerable proportion of

mineral veins with *faults*, or those dislocations of rocks which are indisputably due to mechanical force, as above explained. There are even proofs in almost every mining district of a succession of faults, by which the opposite walls of rents, now the receptacles of metallic substances, have suffered displacement. Thus, for example, suppose *a a*, fig. 513, to be a tin lode in Cornwall, the term *lode* being applied to veins containing metallic ores. This lode, running east and west, is a yard wide, and is shifted by a copper lode (*b b*), of similar width.

Fig. 513.

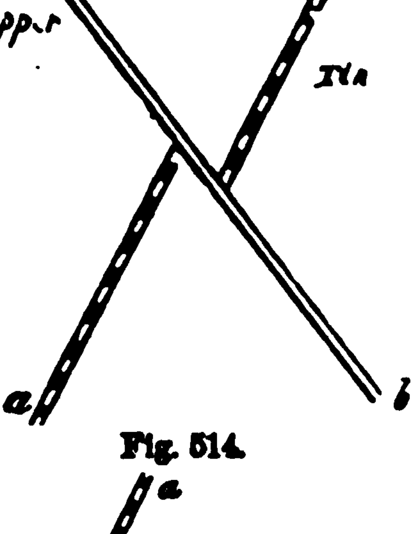


Fig. 514.

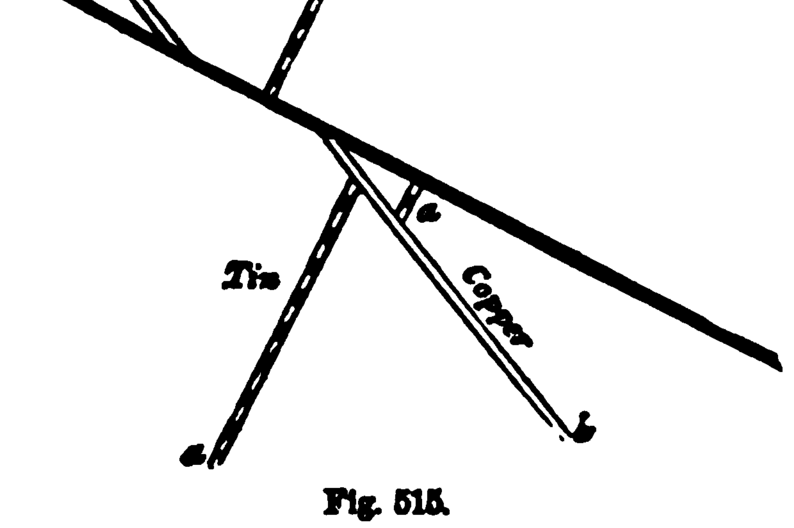
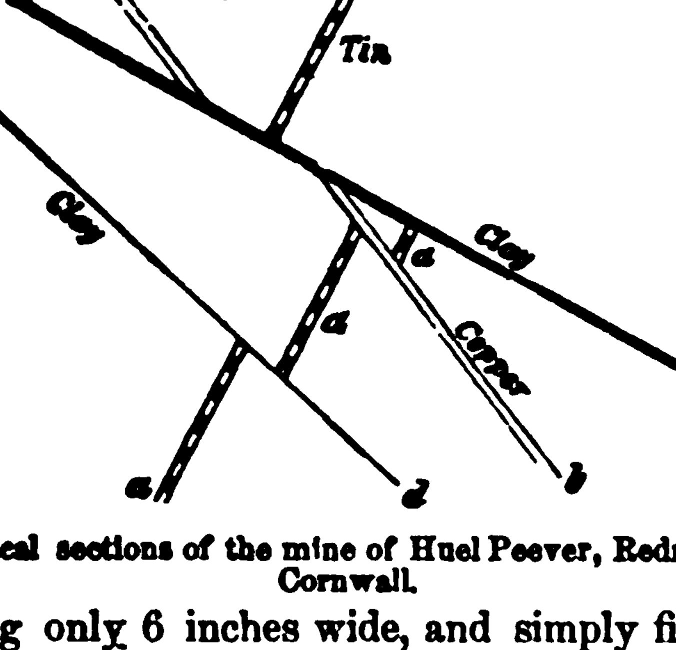


Fig. 515.



Vertical sections of the mine of Huel Peever, Redruth, Cornwall.

The first fissure (*a a*) has been filled with various materials, partly of chemical origin, such as quartz, fluor-spar, peroxide of tin, sulphuret of copper, arsenical pyrites, bismuth, and sulphuret of nickel, and partly of mechanical origin, comprising clay and angular fragments or detritus of the intersected rocks. The plates of quartz and the ores are, in some places, parallel to the vertical sides or walls of the vein, being divided from each other by alternating layers of clay, or other earthy matter. Occasionally the metallic ores are disseminated in detached masses among the veinstones.

It is clear that, after the gradual introduction of the tin and other substances, the second rent (*b b*) was produced by another fracture accompanied by a displacement of the rocks along the plane of *b b*. This new opening was then filled with minerals, some of them resembling those in *a a*, as fluor-spar (or fluate of lime) and quartz; others different, the copper being plentiful and the tin wanting or very scarce.

We must next suppose the shock of a third earthquake to occur, breaking asunder all the rocks along the line *c c*, fig. 514; the fissure, in this instance, being only 6 inches wide, and simply filled with clay, derived, probably, from the friction of the walls of the rent, or partly, perhaps, washed in from above. This new movement has heaved the rocks in such a manner as to interrupt the continuity of the copper vein (*b b*), and, at the same time, to shift or heave laterally in the same direction a portion of the tin vein which had not previously been broken.

Again, in fig. 515 we see evidence of a fourth fissure (*d d*), also filled with clay, which has cut through the tin vein (*a a*), and has lifted it slightly upwards towards the south. The various changes here represented are not ideal, but are exhibited in a section obtained in working an old Cornish mine,

long since abandoned, in the parish of Redruth, called Huel Peever, and described both by Mr. Williams and Mr. Carne.* The principal movement here referred to, or that of *c c*, fig. 515, extends through a space of no less than 84 feet: but in this, as in the case of the other three, it will be seen that the outline of the country above, or the geographical features of Cornwall, are not affected by any of the dislocations, a powerful denuding force having clearly been exerted subsequently to all the faults. It is commonly said in Cornwall, that there are eight distinct systems of veins which can in like manner be referred to as many successive movements or fractures; and the German miners of the Hartz Mountains speak also of eight systems of veins, referable to as many periods.

Besides the proofs of mechanical action already explained, the opposite walls of veins are frequently polished and striated, as if they had undergone great friction, and this even in cases where there has been no shift. We may attribute such rubbing to a vibratory motion known to accompany earthquakes, and to produce trituration on the opposite walls of rents. Similar movements have sometimes occurred in mineral veins which had been wholly or partially filled up; for included pieces of rock, detached from the sides, are found to be rounded, polished, and striated.

Passing over what is said respecting the communication of many veins originally with the surface of the country above, or with the bottom of the sea, we come to the author's views upon "the successive enlargement and filling up of the veins:"

When different sets or systems of veins occur in the same country, those which are supposed to be of contemporaneous origin, and which are filled with the same kind of metals, often maintain a general parallelism of direction. Thus, for example, both the tin and copper veins in Cornwall run nearly east and west, while the lead veins run north and south; but there is no general law of direction common to different mining districts. The parallelism of the veins is another reason for regarding them as ordinary fissures, for we observe that contemporaneous trap dikes, admitted by all to be masses of melted matter which have filled rents, are often parallel. Assuming, then, that veins are simply fissures in which chemical and mechanical deposits have accumulated, we may next consider the proofs of their having been filled gradually and often during successive enlargements. I have already spoken of parallel layers of clay, quartz, and ore. Werner himself observed, in a vein near Gersdoff, in Saxony, no less than thirteen beds of different minerals, arranged with the utmost regularity on each side of the central layer. This layer was formed of two beds of calcareous spar, which had evidently lined the opposite walls of a vertical cavity. The thirteen beds followed each other in corresponding order, consisting of fluor-spar, heavy spar, galena, &c. In these cases, the central mass has been last formed, and the two plates which coat the outer walls of the rent on each side are the oldest of all. If they consist of crystalline precipitates, they may be explained by supposing the fissure to have remained unaltered in its dimensions, while a series of changes occurred in the nature of the solutions which rose up from below; but such a mode of deposition, in the case of many successive and parallel layers, appears to be exceptional.

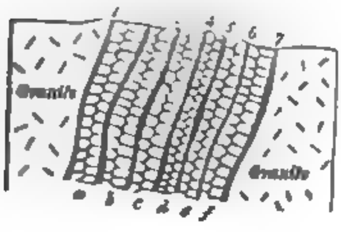
If a vein-stone consist of crystalline matter, the points of the crystals are always turned inwards, or towards the centre of the vein; in other words, they point in that direction where there was most space for the development of the crystals. Thus each new layer receives the impression of the crystals of the preceding layer, and imprints its crystals on the one which follows, until at length the whole of the vein is filled: the two layers which meet dovetail the points of their crystals the one into the other. But in Cornwall, some lodes

---

* Geo. Trans. Vol. I. p. 139; Trans. Roy. Geol. Society of Cornwall, Vol. II. p. 90.

occur where the vertical plates, or *combs*, as they are there called, exhibit crystals so dovetailed as to prove that the same fissure has been often enlarged. Sir H. De la Beche gives the following curious and instructive example (fig. 516) from a copper mine in granite, near Redruth. Each of the plates or combs (*a*, *b*, *c*, *d*, *e*, *f*) are double, having the points of their crystals turned inwards along the axis of the comb. The sides or walls (2, 3, 4, 5, and 6) are parted by a thin covering of ochreous clay, so that each comb is readily separable from another by a moderate blow of the hammer. The breadth of each represents the whole width of the fissure at six successive periods, and the outer walls of the vein, where the first narrow rent was formed, consisted of the granitic surfaces 1 and 7.

Fig. 516.



Copper lode, near Redruth, enlarged at six successive periods.

A somewhat analogous interpretation is applicable to numbers of other cases, where clay, sand, or angular detritus, alternate with ores and vein-stones. Thus, we may imagine the sides of a fissure to be encrusted with siliceous matter, as Von Buch observed, in Lancerota, the walls of a volcanic crater formed in 1731 to be traversed by an open rent in which hot vapors had deposited hydrate of silica, the incrustation nearly extending to the middle. Such a vein may then be filled with clay or sand, and afterwards reopened, the new rent dividing the argillaceous deposit, and allowing a quantity of rubbish to fall down. Various metals and spars may then be precipitated from aqueous solutions among the interstices of this heterogeneous mass.

That such changes have repeatedly occurred, is demonstrated by occasional cross-veins, implying the oblique fracture of previously formed chemical and mechanical deposits. Thus, for example, M. Fournet, in his description of some mines in Auvergne worked under his superintendence, observes, that the granite of that country was first penetrated by veins of granite, and then dislocated, so that open rents crossed both the granite and the granitic veins. Into such openings, quartz, accompanied by sulphurets of iron and arsenical pyrites, was introduced. Another convulsion then burst open the rocks along the old line of fracture, and the first set of deposits was cracked and often shattered, so that the new rent was filled, not only with angular fragments of the adjoining rocks, but with pieces of the older vein-stones. Polished and striated surfaces on the sides or in the contents of the vein also attest the reality of these movements. A new period of repose then ensued, during which various sulphurets were introduced, together with horn-stone quartz, by which angular fragments of the older quartz before mentioned were cemented into a breccia. This period was followed by other dilatations of the same veins, and other sets of mineral deposits, until, at last, pebbles of the basaltic lavas of Auvergne, derived from superficial alluviums, probably of Miocene or older Pliocene date, were swept into the veins. I have not space to enumerate all the changes minutely detailed by M. Fournet, but they are valuable, both to the miner and geologist, as showing how the supposed signs of violent catastrophes may be the monuments, not of one paroxysmal shock, but of reiterated movements.

"On the swelling out and contraction of veins," we make the following extracts:

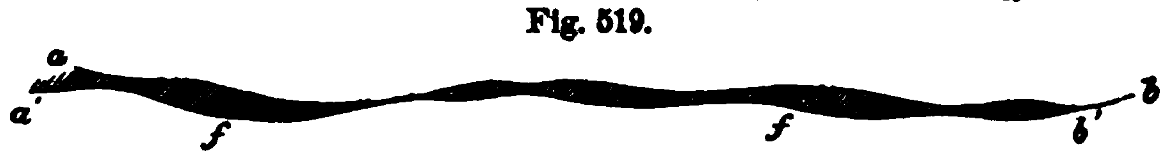
A large proportion of metalliferous veins have their opposite walls nearly parallel, and sometimes over a wide extent of country. There is a fine example of this in the celebrated vein of Andreasburg in the Hartz, which has been worked for a depth of 500 yards perpendicularly, and 200 horizontally, retaining almost every where a width of 3 feet. But many lodes in Cornwall and elsewhere are extremely variable in size, being one or two inches in one part, and then eight or ten feet in another, at the distance of a few fathoms, and

then again narrowing as before. Such alternate swelling and contraction is so often characteristic as to require explanation. The walls of fissures in general, observes Sir H. De la Beche, are rarely perfect planes throughout their entire course, nor could we well expect them to be so, since they commonly pass through rocks of unequal hardness and different mineral composition. If, therefore, the opposite sides of such irregular fissures slide upon each other, that is to say, if there be a fault, as in the case of so many mineral veins, the parallelism of the opposite walls is at once entirely destroyed, as will be readily seen by studying the annexed diagrams.

Fig. 517.

Fig. 518.

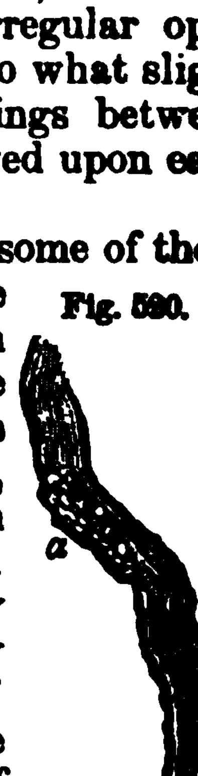
Fig. 519.



Let *a b*, fig. 517, be a line of fracture traversing a rock, and let *a b*, fig. 518, represent the same line. Now, if we cut a piece of paper representing this line, and then move the lower portion of this cut paper sideways from *a* to *a'*, taking care that the two pieces of paper still touch each other at the points 1, 2, 3, 4, 5, we obtain an irregular aperture at *c*, and the isolated cavities at *d d d*, and when we compare such figures with nature we find that, with certain modifications, they represent the interior of faults and mineral veins. If, instead of sliding the cut paper to the right hand, we move the lower part towards the left, about the same distance that it was previously slid to the right, we obtain considerable variation in the cavities so produced, two long irregular open spaces, *f f*, fig. 519, being then formed. This will serve to show to what slight circumstances considerable variations in the character of the openings between unevenly fractured surfaces may be due, such surfaces being moved upon each other, so as to have numerous points of contact.

Most lodes are perpendicular to the horizon, or nearly so; but some of them have a considerable inclination or "hade," as it is termed, the angles of dip varying from 15° to 45°. The course of a vein is frequently very straight; but if tortuous, it is found to be choked up with clay, stones, and pebbles, at points where it departs most widely from verticality. Hence at places, such as *a*, fig. 520, the miner complains that the ores are "nipped," or greatly reduced in quantity, the space for their free deposition having been interferred with in consequence of the pre-occupancy of the lode by earthy materials. When lodes are many fathoms wide, they are usually filled for the most part with earthy matter, and fragments of rock, through which the ores are much disseminated. The metallic substances frequently coat or encircle detached pieces of rock, which our miners call "horses" or "riders." That we should find some mineral veins which split into branches is also natural, for we observe the same in regard to open fissures.

Fig. 520.



Passing over all that is said relative to "chemical deposits in veins," we conclude with one further extract on the "relative age of the different metals:"

Relative age of the different metals.—After duly reflecting on the facts above described, we cannot doubt that mineral veins, like eruptions of granite or trap, are referable to many distinct periods of the earth's history, although it may be more difficult to determine the precise age of veins; because they have often remained open for ages, and because, as we have seen, the same

fissure, after having been once filled, has frequently been reopened or enlarged. But besides this diversity of age, it has been supposed by some geologists that certain metals have been produced exclusively in earlier, others in more modern times,—that tin, for example, is of higher antiquity than copper, copper than lead or silver, and all of them more ancient than gold. I shall first point out that the facts once relied upon in support of some of these views are contradicted by later experience, and then consider how far any chronological order of arrangement can be recognized in the position of the precious and other metals in the earth's crust. In the first place, it is not true that veins in which tin abounds are the oldest lodes worked in Great Britain. The government survey of Ireland has demonstrated, that in Wexford veins of copper and lead (the latter as usual being argentiferous) are much older than the tin of Cornwall. In each of the two countries a very similar series of geological changes has occurred at two distinct epochs,—in Wexford, before the Devonshire strata were deposited; in Cornwall, after the carboniferous epoch. To begin with the Irish mining district: We have granite in Wexford, traversed by granite veins, which veins also intrude themselves into the Silurian strata, the same Silurian rocks as well as the veins having been denuded before the Devonshire beds were superimposed. Next we find, in the same county, that elvans, or straight dikes of porphyritic granite, have cut through the granite and the veins before mentioned, but have not penetrated the Devonian rocks. Subsequently to these elvans, veins of copper and lead were produced, being of a date certainly posterior to the Silurian, and anterior to the Devonian; for they do not enter the latter, and, what is still more decisive, streaks or layers of derivative copper have been found near Wexford in the Devonian, not far from points where mines of copper are worked in the Silurian strata.

Although the precise age of such copper lodes cannot be defined, we may safely affirm that they were either filled at the close of the Silurian or commencement of the Devonian period. Besides copper, lead, and silver, there is some gold in these ancient or primary metalliferous veins. A few fragments also of tin found in Wicklow in the drift are supposed to have been derived from veins of the same age.

Next, if we turn to Cornwall, we find there also the monuments of a very analogous sequence of events. First the granite was formed; then, about the same period, veins of fine-grained granite, often tortuous, penetrating both the outer crust of granite and the adjoining fossiliferous or primary rocks, including the coal-measures; thirdly, elvans, holding their course straight through granite, granitic veins, and fossiliferous slates; fourthly, veins of tin also containing copper, the first of those eight systems of fissures of different ages already alluded to. Here, then, the tin lodes are newer than the elvans. It has indeed been stated by some Cornish miners that the elvans are in some few instances posterior to the oldest tin-bearing lodes, but the observations of Sir H. de la Beche during the survey led him to an opposite conclusion, and he has shown how the cases referred to in corroboration can be otherwise interpreted. We may, therefore, assert that the most ancient Cornish lodes are younger than the coal-measures of that part of England, and it follows that they are of a much later date than the Irish copper and lead of Wexford and some adjoining counties. How much later it is not so easy to declare, although probably they are not newer than the beginning of the Permian period, as no tin lodes have been discovered in any red sandstone of the Poikilitic group, which overlies the coal in the southwest of England.

There are lead veins in the Mendip hills which extend through the mountain limestone into the Permian or Dolomitic conglomerate, and others in Glamorganshire which enter the lias. Those worked near Frome, in Somersetshire, have been traced into the Inferior Oolite. In Bohemia, the rich veins of silver of Joachimsthal cut through basalt containing olivine, which overlies tertiary lignite, in which are leaves of dicotyledonous trees. This silver, therefore, is decidedly a tertiary formation. In regard to the age of the gold of the

Ural Mountains, in Russia, which, like that of California, is obtained chiefly from auriferous alluvium, we can merely affirm that it occurs in veins of quartz in the schistose and granitic rocks of that chain. Sir R. Murchison observes, that no gold has yet been found in the Permian conglomerates which lie at the base of the Ural Mountains, although large quantities of iron and copper detritus are mixed with the rolled pebbles of these same Permian strata. Hence it seems that the Uralian quartz veins, containing gold and platinum, were not exposed to aqueous denudation during the Permian era. But we cannot feel sure, from any data yet before us, that such auriferous veins of quartz may not be as old as the tin lodes of Cornwall, in which, as well as the more ancient copper lodes of Ireland, some gold has been detected. We are also unable at present to assign to the gold veins of Brazil, Peru, or California, their respective geological dates. But, although enough is known to show that Ovid's line about the "Age of Gold," "Aurea prima sata est ætas," would, by no means, be an apt motto for a treatise on mining, it would be equally rash in the present state of our inquiries to affirm, as some have done, that gold was the last-formed of metals.

It has been remarked by M. de Beaumont, that lead and some other metals are found in dikes of basalt and green-stone, as well as in mineral veins connected with trap rocks, whereas tin is met with in granite and in veins associated with the granitic series. If this rule hold true generally, the geological position of tin in localities accessible to the miners will belong, for the most part, to rocks older than those bearing lead. The tin veins will be of higher relative antiquity for the same reason that the "underlying" igneous formations or granites which are visible to man are older, on the whole, than the overlying or trappean formations.

If different sets of fissures, originating simultaneously at different levels in the earth's crust, and communicating, some of them, with volcanic, others with heated plutonic masses, be filled with different metals, it will follow that those formed farthest from the surface will usually require the longest time before they can be exposed superficially. In order to bring them into view, or within reach of the miner, a greater amount of upheaval and denudation must take place in proportion as they have lain deeper when first formed. A considerable series of geological revolutions must intervene before any part of the fissure, which has been for ages in the proximity of the plutonic rocks, so as to receive the gases discharged from it when it was cooling, can emerge into the atmosphere. But I need not enlarge on this subject, as the reader will remember what was said in the 30th, 34th, and 37th chapters, on the chronology of the volcanic and hypogene formations.

Art. VII.—QUARTZ MINING OPERATIONS IN CALIFORNIA.

Gold is found in crystalline primitive rocks, transition rocks, trap rocks and alluvial grounds. It never predominates to such an extent as to constitute distinct veins by itself. It is either disseminated, and as it were impasted, in strong masses, or spread out in thin plates or grains on the surface, or lastly implanted in their cavities under the shape of filaments or crystallized twigs. The minerals composing the veins are either quartz, calcspar, or sulphate of baryta.

With the exception of iron, it may be safely asserted that the geological districts, within which gold occurs, embrace a larger

aggregate area than that of any other metal. Yet the proportion of gold to that of the substances from which it must be separated for the use of mankind is so moderate, that the cost of eliminating it must necessarily be such as to maintain a high commercial value in all future time.

The gold-bearing veins of rock usually consist of quartz, a white vitreous stone, and one of the ingredients of granite. These, like all true veins, are generally inclined at a large angle to the plane of the horizon, and are often vertical or nearly so. In thickness they vary considerably; the same vein is sometimes contracted to the width of a few inches, whilst at other points it is expanded in thickness to many yards. They extend downwards to greater depths than the miner has ever reached.

By far the largest portion of gold hitherto has been procured from the deposits of diluvium and alluvium in the valleys and ravines which have been formed in those regions where metallic veins existed prior to the formation of such valleys and ravines.

Notwithstanding the apparently large quantity of gold hitherto procured in these deposits, from the most remote periods, we may safely assume that it bears an infinitely small proportion to what yet remains imprisoned within the rocks, at no greater distance from the surface than has already been reached by the industrious miner in other researches. The small amount of space occupied by the ravines and valleys of excavation in metalliferous regions, compared with that remaining below and between them, clearly proves the correctness of this opinion.

In our remarks upon gold mining in this article, we shall confine our attention strictly to the method of obtaining the metal from the rock, or quartz mining, as it is called.

The first attempts at quartz mining in the State were made on the Mariposa in the southern section of the gold region, some details of which are described in the following letter from a friend:

In regard to the commencement of quartz mining in California, Capt. Wm. Jackson and Mr. Eliason, both natives of Virginia, were about the first that attempted any thing. I had often, while at San Francisco, heard men who pretended to be competent judges, say that there were no such things as veins of auriferous or gold-bearing quartz in California, and even if there ever had been, they were all broken up by some great eruption, and had since been decomposed. After hearing such opinions expressed, I visited Stockton in the latter part of May, 1850, in company with Joseph C. Palmer, of the firm of Palmer, Cook & Co.; and Mr. Warbass, of the firm of Warbass & Co., of Sacramento. While at Stockton we met with Capt. Jackson, who had just come down from Mariposa. He had some rich quartz specimens, taken from the big Mariposa vein. He wished us to go up and see the vein, and offered to sell the greater part of it to us. Some of us went, and found Capt. Jackson's partner, Mr. Eliason, and eight men at work (three of them Mexicans and the rest Americans). They were pulverizing the quartz dry in iron mortars with spring poles. The weight of the mortars was about 100 lbs. After pulverizing the ore, they amalgamated it in a Virginia rocker. The ore that they were stamping was very rich, yield-

ing from $15 to $20 per 100 lb. After viewing their stamping process, we examined the vein. It was laid open on the top some sixty or eighty feet, and was to all appearances extremely rich, as we could see gold with the naked eye the whole length of the opening. We purchased for Palmer, Cook & Co., Warbass and myself, ⅘ths of their claims on the vein, the other ⅕th being retained by Capt. Jackson, who recommended a Chilian mill very highly. He thought such a mill capable of crushing some four or five tons of ore per twenty-four hours. At great expense we put the mill up, and set it in motion with mule power. The utmost extent it could crush in twelve hours was 500 to 600 lbs; the yield, however, for the amount crushed was exceedingly good, being from $250 to $275 every four or five days. We soon got out of patience with this slow machine, although to do it justice, the Chilian mill did its work better and yielded more gold for the amount of quartz crushed, than any quartz machine that I have since seen in operation. Our company in August, 1850, made arrangements for a set of machinery capable, as it was said, of crushing 20 tons of quartz per day. The machinery was the Stockton stamps, with bowls and shaking table, &c., the stamps weighing 209 lbs. each. This was put in motion the first of Sept., 1850, but as we had not got the right motion for the shaking table, we lost a great deal of gold, and found that we could stamp only 2½ tons in 12 hours, or 5 tons in 24. A great many visitors from both the Northern and Southern mines called upon us, as this was the first steam engine, and quartz machinery of any importance, put up in the mountains. After trying various experiments with great expense through the fall and part of the winter, we made four new shaking tables, and connected them with the stamps in such a manner, that the pulverized ore ran directly from the stamps to the tables, the tables running with a motion of from 75 to 90 a minute, according to the fineness or coarseness of the pulverized ore. About the same time we commenced calcining our ore, which reduced expenses, and made the quartz work much better, and destroyed the sulphurets, which frequently coated the gold. Through the fall and winter we employed a number of Cornish miners, and in sinking our shafts struck several very rich lodes. They stated that the mine was richer in gold than many of the tin mines that they had worked in England were in tin. We had now got along quite well, but still found that our quartz would not pay (although the yield was from $20 to $60 per ton), as our machinery was altogether too light and inefficient, and our sieves too coarse, so that we could not stamp the quartz fine enough to get out the gold. The mine has been kept in operation much of the time, and the company are intending to put on heavy machinery.

This was a rude attempt to apply the practical knowledge of the gold miners of the Atlantic States to mining under the novel state of social affairs which existed in California. To a certain extent this particular case was a failure. The small results obtained in consequence of feeble machinery, under the high expenses which prevailed, were the principal cause. Low expenses and more powerful machinery, or sufficiently low expenses with the same machinery, would probably have made this instance a prosperous case.

We dwell particularly upon this instance, as it serves to bring out, in a clear light, those which are perhaps the most important points of consideration in estimating the pecuniary prospects of quartz mining in California. For rich gold veins are so abundant, that it is hardly to be expected, after the extensive explorations already made, that much time will be consumed in working poor

ones. Is, then, the machinery sufficiently powerful, and the process of amalgamation sufficiently perfect, to bid defiance to the high cost of labor, or has the decline of wages and expenses been sufficient to counterbalance the imperfections of machinery? on the side of machinery, there has been a steady improvement since this first experiment, and on the side of wages, there has been a steady decline, even to the present hour. We are disposed to infer that the day is not far off, when the systematic labor of the Atlantic States will be applied to this branch of industry in California, even if it has not already begun.

The rainy season in California, which causes serious interruptions to all mining pursuits, generally commences in December, and continues often into the ensuing month of March. During this period, more or less rain falls almost daily, thus rendering the roads heavy and almost impassable, and often filling the shafts of the mines with more or less water. In the months of January, February, and March, of the last year, the rains were more than usually abundant and protracted, and the weather was often severely inclement. The corresponding months of the present year were less severe. In the month of December last, snow made its appearance to unusual depths, causing an entire cessation for a time of all mining operations, and producing sudden and destructive floods in the small streams and rivers.

During the short period in which mills have been in operation, there has not probably been one at which the system of labor was so well organized as to secure a stock of the rock on hand to be crushed during the rainy season. The consequence has been that the mills have been idle for a portion of the rainy period, or it has been devoted to repairs.

Wood appears to be abundant in all the districts where mills are in operation; but that heretofore consumed for raising steam has been mostly unseasoned. Thereby a loss of steam power has ensued, causing in some instances a difference of nearly one-half. A well organized system of labor will remove all embarrassments of this nature.

The usual expenses of a year in working a simple quartz mill under an experienced superintendent, consist of the wages paid to the workmen, expenses for their board, the cost of wood, and various incidentals for repairing the mill, hauling rock, &c. Wages are paid to the workmen only for the time they work; but it has been the practice, heretofore, to board them, even when the mill was not in operation, that they might be on hand. The number varies according to the amount of rock to be got out. Their wages have steadily declined as the population has increased, until they range from two and a half dollars upward, according to the kind of labor done.

The expense of wood consists merely in the cutting and hauling. It is generally abundant and of good quality. It is, with the exception of a few ranches, all in common. Nothing more is necessary to obtain the ownership of a wood lot, than to take out a pre-emption right and inclose the lot.

The title to real estate in California, especially mining tracts, is of such a kind as circumstances alone have created, but its validity in consequence of a general Act of the State Legislature, is as good as in any State of the Union against all persons or powers, except the government of the United States. Nor could the United States, after having suffered their rights to remain dormant for such a length of time, now set up a claim to the mining lands, or attempt to enforce one, which would easily be acquiesced in by the people.

The right to dig in any spot is called a claim; but by a regulation among the miners themselves, no person can set up an original claim to more than one hundred feet in length of a quartz vein. If, therefore, any one discovers a quartz vein, and commences working it, the miners who hear of the discovery immediately come on the ground and stake out, each man for himself, a hundred feet, and begin work. The original discoverer is allowed an extra hundred feet, in consideration of his discovery. After the several claims are staked out, one of the number of persons is elected a recorder; and a record is made of the claims as of the deeds in a county clerk's office. To this record an Act of the Legislature has given the same validity as that which is possessed by the records in the other States. A paper, which is a copy of the record, is also affixed to some tree on the spot.

After these steps have been taken, any individual can sell his claim to a purchaser, and the sale passes a title which is good against all the world—the United States only excepted.

Such is the title derived from occupation and settlement. It obtains entire confidence; for the opinion prevails in all parts of the State, as we are informed, that the government of the United States will manifest the same liberality, and extend the same protection to the pioneers and settlers in California, as to the emigrants to other new States. There is also a class of titles derived from Mexican grants, each embracing tracts of several leagues. There are only a few of these, and but little respect has hitherto been paid to them by miners.

Claims, such as we have been speaking of, are often sold for many thousand dollars. The price of a vein is governed by the richness of the ore, and the facility with which wood and water can be obtained. These are indispensable requisites for mining in the rock. Richer veins without wood and water at hand, command a much lower price from this scarcity.

There are two important points in the labor of quartz mining, wherever it is carried on. The first, is to crush the rock in which the gold is found; and the second, is to extract all the gold from the powder after it is crushed.

To be successful in obtaining the gold, the rock should first be crushed or ground as fine as flour; for the smallest grits may contain particles of the metal. The best machinery in existence for this purpose, when the rock mining was commenced in California, was the Chilian mill; so called from its extensive use in parts of South America. This was the first machinery used in gold mining in California, unless we except the iron pestle and mortar used by hand. It crushed about five hundred pounds of rock in twelve hours, and yielded from two to four hundred dollars in three or four days. The expense of running this kind of mill is considerable, and they are therefore unprofitable in consequence of their inefficiency.

Georgia stamps were next introduced. But these were made to weigh only about one hundred and fifty to two hundred pounds. These would crush from a ton and a half to five tons in twelve hours. But they did not crush the rock as fine as the Chilian mill, and therefore, pound for pound, would not produce so much gold as the latter.

This light and imperfect machinery was set up under the anticipation that the rock would yield from two to three dollars of gold per pound. The standard yield at present established, and below which mining is not attempted, is two cents of gold to the pound of rock, or forty dollars to the ton.

The next step in the progress of crushing the rock, was to introduce heavy machinery. For it was proved that machinery which would work to a profit under the low wages in the Southern States, would bring ruin upon its proprietors in California.

But even with these stamps, the rock is not crushed sufficiently fine to render it possible to obtain more than half the gold it contains, with the present amalgamators for separating the gold. It is a trait of American character never to be satisfied with imperfectly doing a thing, where gold is at stake. Several machines have therefore been invented, which, judging by the success of experiments with models, promise to crush to a fine powder very many tons of rock daily. These have been constructed in New-York and taken out to California at great expense, by men who belong there, and who have been engaged in rock mining for some years past, and who are the only class who are actually acquainted with the mining resources of California.

The amalgamation process, which consists in intermingling the crushed rock with quicksilver, is very imperfectly performed, chiefly in consequence of the coarseness of the crushed rock.

Heavy stamp heads last not longer than three to six months, for crushing quartz, unless the iron has been well hardened. That part of the machinery requiring the most frequent repair, is the timbers of the stamps and the slides in which they play.

The field for improvement in this business is unquestionably immense. The mills have not been run night and day; a stock of rock has not been secured for wet weather; inefficient means are possessed for pumping out shafts, or raising the rock; it is not crushed sufficiently fine; and the gold is very imperfectly separated—these are the more immediate embarrassments which the miner must encounter. Surely the richness of that region cannot be estimated, if we consider the rapid strides in quartz mining amid all the embarrassments. It is gratifying to know that this branch of industry is rapidly assuming that character which attaches to a well organized and settled pursuit in the hands of capitalists and experienced men.

JOURNAL OF MINING LAWS AND REGULATIONS.

AN ACT TO AUTHORIZE THE FORMATION OF CORPORATIONS FOR MINING, SMELTING, OR MANUFACTURING IRON, COPPER, MINERAL COAL, SILVER OR OTHER ORES OR MINERALS, AND FOR OTHER MANUFACTURING PURPOSES.

SECTION 1.—*The People of the State of Michigan enact*, All corporations organized and established under the provisions of this act, shall be capable of suing and being sued, in any court in this State, and may have a common seal, and alter or amend the same at pleasure; may elect in such a manner as they shall determine, all necessary officers; may fix their compensation and determine their duties, and make, from time to time, such by-laws, not inconsistent with the constitution and laws of this State, as a majority of the stockholders shall direct.

Sec. 2.—Any number of persons, not less than three, who shall, by articles of agreement in writing, associate according to the provisions of this act, under any name assumed by them, for the purpose of engaging in and carrying on any kind of mining or manufacturing business, and who shall comply with the provisions of this act, shall, with their successors and assigns, constitute a body politic or corporate, in fact, and under any name assumed by them in their articles of association, provided no two companies shall assume the same name.

Sec. 3.—Before any corporation formed under this act shall commence business, the president and directors shall cause their articles of association to be filed with the Secretary of State of this State, and with the county clerk of the county or counties in which any such corporation shall conduct its mining or manufacturing business; which said articles shall be recorded in said office at length, in books prepared for that purpose at the expense of said corporation.

Sec 4.—The articles of every such association shall be signed by the persons associating in the first instance, and acknowledged before some person authorized by the laws of the State to take acknowledgments of deeds, and shall state:

1. Distinctly and definitely the purpose for which the same is formed.
2. The amount of their capital stock, and the number of shares.
3. The amount of capital stock actually paid in.
4. The names of the stockholders, their respective residences, and the number of shares held by each person.
5. The place in this State where their office for the transaction of business is located, and the county or counties in which their business is to be carried on.

6. The term of its existence not to exceed thirty years.

Sec. 5.—Every such corporation shall annually, in the month of July, make a report, signed by a majority of the board of directors, containing:

1. The amount of capital actually paid in.
2. The amount invested in real estate.
3. The amount of personal estate.
4. The amount of their debts and credits, as near as may be.
5. The name of each stockholder, and the number of shares held by him, at the date of such report; and every such report shall be verified on oath by the officers signing the same: and if any person shall, as to any material facts, knowingly swear or affirm falsely, he shall be deemed guilty of perjury, and be punished accordingly.

Sec. 6.—The amount of the capital stock in every such corporation shall be fixed and limited by the stockholders in their articles of association, and shall, in no case, be less than ten thousand dollars, nor more than five hundred thousand dollars, and shall be divided into shares of twenty-five dollars each. The capital stock may be increased, and the number of shares, at any meeting of the stockholders called for that purpose: *Provided*, that the amount so increased shall not, with the existing capital, exceed five hundred thousand dollars.

Sec. 7.—The purposes for which every such corporation shall be established, shall be distinctly and definitely specified in the articles of association; and it shall not be lawful for said corporation to appropriate its funds to any other purpose.

Sec. 8.—When any corporation shall be formed under this act, any two of those associated may call the first meeting of the corporation at such time and place as they may appoint, by giving notice thereof by publishing the same in a newspaper at least fifteen days before the time appointed for such meeting.

Sec. 9.—The stock, property and affairs of such corporation, shall be managed by not less than three, nor more than nine directors, as the article shall determine, one of whom shall be a resident of this State. They shall hold their office one year, and until their successors shall be duly chosen.

Sec. 10.—The directors of every such corporation shall choose one of their number president, and such other officers as their articles of association and by-laws may require, who shall hold their offices one year, or until a majority of the stockholders choose others in their stead. The directors, for the time being, shall have power to fill any vacancy which may happen in their board by death, resignation, or otherwise, for the current year.

Sec. 11.—The directors may call in the subscription to the capital stock of such corporation by instalments, in such portion and at such times and places as they shall think proper, by giving notice thereof as the by-laws shall prescribe, and in case any stockholder shall neglect or refuse payment of any such instalment for the space of sixty days after the same shall have become due and payable, and after he shall have been notified thereof, the stock of such delinquent stockholder may be sold by the directors at public auction, at the office of the secretary of the corporation, giving at least thirty days' notice in some newspaper published in the county: *Provided*, that if said stockholder shall reside in this State, the stock shall be sold at the business office of said corporation, in the county in which they are doing business, giving at least thirty days' notice thereof in some newspaper published in the county; if no newspaper be published in the county in which such corporation transact their business, then it shall be published in some newspaper in the city of Detroit; and the proceeds of such sale shall be first applied in payment of the instalment called for, and the expenses on the same, and the residue shall be refunded to the owner thereof; and such sale shall entitle the purchaser to all the rights of a stockholder to the extent of the shares so bought.

Sec. 12.—A majority of the directors of every such corporation, convened according to the by-laws, shall constitute a quorum for the transaction of business; and those holding a majority of the stock, at any meeting of the stock-

holders, shall be capable of transacting the business of the meeting; and at all meetings of such stockholders each share shall be entitled to one vote. Stockholders may appear and vote in person, or by proxy, duly filed.

Sec. 13.—If it shall so happen that an election of directors shall not take place at the annual meeting, such corporation shall not be dissolved, but the election may be held at any time thereafter, by giving thirty days' notice of the time and place of such election, in the manner provided in the eleventh section.

Sec. 14.—The books of every such corporation containing the accounts, shall at all reasonable times be open for the inspection of any of the stockholders, and so often as once in each year a statement of the accounts of such corporation shall be made by order of the directors, and laid before the stockholders.

Sec. 15.—Every such corporation shall by their name have power to acquire and hold all such real and personal estate as shall be necessary for the purposes of carrying on the business of such corporation; *Provided*, that their real estate shall not exceed three thousand acres.

Sec. 16. The stock of every such corporation shall be deemed personal property, and shall be transferred only on the books of such company in such form as the directors shall prescribe; and such corporation shall at all times have a lien upon the stock or property of its members, invested therein, for all the debts due from them to such corporation, which may be enforced by advertisement and sale, in the manner herein provided for selling delinquent stock; and all purchasers at such sale shall be entitled to the rights of stockholders.

Sec. 17. The stockholders of all corporations founded upon this act, shall be individually liable for all labor performed for such corporation or associations, which said liability may be enforced against any stockholders founded on this statute at any time after an execution shall be returned not satisfied against said company: *Provided always*, that if any stockholder shall be compelled by any such action to pay the debts of any creditor, or any part thereof, he shall have the right to call upon all the stockholders to contribute their part of the sum so paid by him as aforesaid, and may sue them jointly or severally, or any number of them, and recover in such action the ratable amount due from the person or persons so sued.

Sec. 18. Every such corporation formed for mining purposes, shall annually in the month of July, in each year, make a report, which shall state the amount of copper, iron or other mineral which such company may have mined within the year past, which report shall be signed by the president and a majority of the directors, and shall be verified by the oath of the secretary or other officer making the same, and be filed in the office of the clerk of the county in which the business of any such corporation is carried on, and a duplicate thereof in the office of the Auditor General.

Sec. 19. Every corporation formed under the provisions of this act, for the purposes of carrying on manufacturing business, shall annually in the month of July, in each year, make a report, which shall state the amount of capital actually paid in, and the amount borrowed by such company and remaining unpaid in whole or in part; which report shall be signed by a majority of the directors, and verified by the oath of the secretary or other officers making the same, and be filed in the office of the clerk of the county in which the business of any such corporation is carried on, and a duplicate thereof in the office of the Auditor General.

Sec. 20. All corporations formed under the provisions of this act for the purpose of mining, shall pay into the State treasury specific taxes, as follows, that is to say: every such corporation engaged in copper mining, shall pay a tax of one dollar for each ton of copper of mineral obtained, every such corporation engaged in iron mining, shall pay a tax of ten cents for each ton of iron obtained, and every such corporation engaged in coal mining, shall pay a tax of one-half cent for each ton of coal obtained by such corporation in such mining business; which taxes shall be paid annually, in the month of July, at the office of the State Treasurer, or such place in the city of Detroit as he may de-

signate; and the same shall be in lieu of all State taxes to be paid by such corporations respectively: *Provided*, nothing herein shall exempt from State taxation, any property of said corporation not invested in the said mining or manufacturing business, contemplated in this act.

Sec. 21. All corporations formed under the provisions of this act, for manufacturing purposes, shall pay to the State a specific tax of one-half of one per cent. on the amount of their capital stock paid in, and also money borrowed, which for this purpose shall be considered as capital stock of such corporations. The said tax shall be paid on the first day of September, at the office of the State Treasurer, or such place in the city of Detroit as he may designate, and the same shall be in lieu of all State taxes to be paid by such corporations respectively.

Sec. 22. Service of any legal process against any corporation formed under this act, may be made on the president, secretary, or agent, or if neither of them can be found in the county in which by their articles of association they are to do their business, then such service may be made by posting a true copy thereof on some conspicuous place at the business office of the company in said county.

Sec. 23. If the directors of any such company shall intentionally neglect or refuse to comply with the provisions and to perform the duties required of them by sections three, five, eighteen and nineteen of this act, they shall be jointly and severally liable in an action founded on this statute for all the debts of such corporation contracted during the period of such neglect or refusal; and such of them as were present and acting as such directors at any time during such neglect or refusal, shall be guilty of a misdemeanor, and may, on conviction thereof, be fined a sum not exceeding five thousand dollars, or imprisoned for a term not exceeding two years, or both, in the discretion of the court.

Sec. 24. If any such corporation, organized and established under this act, shall wilfully violate any of its provisions, and shall thereby become insolvent, the directors ordering or assenting to such violation shall jointly and severally be liable in an action founded on this statute for all debts contracted after such violation.

Sec. 25. The legislature may at any time, for just cause, rescind the powers of any corporation created pursuant to the provisions of this act, and prescribe such mode as may be necessary or expedient for the settlement of its affairs. The legislature may repeal, alter, or amend this act.

Sec. 26. That this act shall be subject to the provisions of chapter fifty-five, title ten, of the revised statutes of 1846, so far as applicable to companies formed under this act.

Sec. 27. This act shall take effect immediately.

Approved February 5, 1853.

LOCAL MINING LAWS OF CALIFORNIA.

The bill before the Legislature of California at its late session, to provide for the establishment of the Local Mining Laws in the State, and which was printed in the previous number of this Magazine, passed the House, and also the Senate, it is said, with amendments, and was then suffered to expire on the clerk's table. The following indignant remarks of the Alta Californian, on the subject, present a strong picture of the present state of the local mining laws, in the absence of any action by the Legislature.

During the last autumn there was a very general call for a Miners' State Convention. Such a convention would have doubtless occurred, had not the Legislature, in the earlier stages of the session, given promise of doing something to render such an assemblage unnecessary. But all these promises have been belied. The miners have been shamefully trifled with, and now for another year there must be the same uncertainty—the same conflicting of laws and claims—the same roving and thriftless habits that always have prevailed, and al-

ways will prevail, so long as the regulation of the mines is left to the bare majority that may happen to be at any time in any little camp or neighborhood. The laws of to-day may be repealed to-morrow, the holder of a claim when the water gives out in the spring, may be obliged to lay by, at great disadvantage, and watch it through the summer, for he knows not but the laws, under which he holds it, may be repealed as soon as he leaves to look for employment for a time elsewhere. And if he spends months in prospecting, and by deep digging, and extensive exploration, he lights on something which would, if justice were done, pay him well for his labor, Levi Muggins will settle down on one side of him, and John Chinaman on the other, and will limit him to sixteen or twenty feet, while his neighbors will have equally good claims with himself, even though he may have spent months in his search or in sinking his shaft. He has no security of holding any thing that will justify his expenditures of time and money in prospecting, except from the good nature of his neighbors. While this is the case men will not so frequently sink deep shafts and thoroughly prospect the auriferous hills around them, for it is not the hand that beats the bush that catches the bird.

FOREIGN MINERS' TAX LAW.

An act was passed early in the recent session of the California Legislature, which provides that on and after the 30th of March, 1853, no person not being a citizen of the United States (California Indians excepted), shall be allowed to take gold from the mines of California, unless he shall have a license therefor. The amount to be paid for each license is $4, which allows a person to work in the mines for one month, and no longer without a renewal. The Sheriff of the county is authorized to issue the license, and collect the tax. There are severe penalties for any violations of the provisions of the law.

AUSTRALIAN GOLD MINING LAW.

Under this law a double license fee is imposed on all foreigners, who are likewise restricted from working quartz claims or leases.

Letters from Sydney, New South Wales, under date of February 15, say :—

"The recent mining regulations, of which we sent you a copy with our last, are exciting very general discontent, not only amongst resident foreigners, but also in the minds of the colonial community. Should the present crisis pass over without serious disturbances, there can be little doubt, that at the next session of the Council, probably in May next, the obnoxious clauses of the bill will either be repealed or modified; otherwise it will lead to the abandonment of the New South Wales mines, by all foreigners and large numbers of Englishmen, which process indeed is now rapidly going on."

On this subject the *Empire* of the 2d very properly observes :—A meeting was held in Sydney, on the 8th March. The attendance was large. It was manifest that the grievance was felt to be a public and common one, far beyond the interests of the class specially affected; that in fact all parties had their prosperity more or less, directly or indirectly, threatened by it. It was regarded as violating some of the dearest rights of British freedom. A petition to the governor was adopted requesting him to assemble the council at once to repeal or amend the obnoxious statute. His excellency replied to the deputation that he would, as soon as possible, consult the Executive Council and communicate the result. In a few days the reply of the governor was received, stating the impracticability of convening the legislature before the time originally fixed, on account of some elections which have to take place, but intimating that the government would be prepared with an amendment bill as soon as that body could meet. The reply, although not exactly a compliance with the prayer of the petitioners, was still felt to be conciliatory, and all parties are now waiting in hope that the objectionable principles of the act will be expunged.

COMMERCIAL ASPECT OF THE MINING INTEREST.

The aspect of the mining interest in this city is without any very material change since the beginning of the month. The stocks of mining companies have met with small sales, such as are consequent upon the period of the year and the state of every kind of business. Opinion in regard to them is generally elevated, sanguine, confident.

We omit any notice of the particular transactions in the stock of any company, for these have been quite limited.

Mining stocks are looked upon with increased favor, not only from a general conviction of the immense mineral resources which exist around us, but from the fact that those branches of mining which have been longest pursued have generally done well. No one doubts that the copper region has a real and intrinsic value, as much as the coal regions of Pennsylvania. The same is true of the North Carolina copper region and other sections; so also of the lead and silver mines, and the quarries of various localities. In general one mining company may for a time do better than its neighbor, from the single fact of being located at a richer spot on a vein, or of having a richer vein. But where explorations have been properly made, showing an extensive deposit of mineral, and assays show a richness equal to most of those at present made public, there can be no question of the value of such a mine. The stock of a company owning it, if not too great in amount, will always be valuable if the mine is worked with judgment and prudence. We would not say that the fancy stock of every mine which is offered will be valuable. It may be in the hands of those only who hold to sell. The first requisite for value in a mining stock is, that there should be a good mine, and that the owners of it should set themselves in earnest to work it with judgment, industry and economy. Where these circumstances exist, with the other usual favorable incidents, the stock will be valuable; we care not if it is a coal mine, a copper mine of Lake Superior, Maryland, North Carolina, a lead mine, or almost any other mine.

But while we have such confidence in the real value of the mines of our country, we are as strongly convinced of two additional and important facts; the one is, that the proprietors of mines, and especially the executive officers of mining companies, have not yet learned to appreciate and execute downright economy of management; the other fact is, that the spirit of the day is in conflict with an economical management. What is done, must be done quickly; a dividend must be declared even before there has been time to commence an extended and substantial system of operations. The future is apt to be sacrificed to the present in the strife for success, and thus true and permanent prosperity is lost sight of.

But the mining interest of the country will come triumphantly out of all such occasional and individual embarrassments. If the present owners and managers of some mines lose by want of economy, there are others who will take their places and prosper.

We make these remarks because, while we are publishing reports of exploring Geologists and Assayists, as of the utmost importance to determine the value

of minerals, it should not be lost sight of, that they are scarcely of more importance to an enterprise than the kind of management which shall come after them.

Importation of Metals, Coals, &c., at New-York from June 24th to July 15th, 1852.

	Quantity.	Value.
Brass Goods	30	$9,012
Copper Bars	1,248	41,610
"	52	4,820
Sheathing	280	17,339
Dutch Metal	15	2,526
Iron tons	5,153	226,825
" Pig "	2,894	41,043
R. R. bars	38,441	317,468
Sheet do. pgs.	11,565	48,629
Hoop do. pgs.	2,838	4,198
Lead	25,027	80,208
Steel	3,150	44,082
Tin	25,245	224,128
Zinc	380	20,389
Platina	2	1,072
Coal tons	2,556	6,870
Lithographic stone	53	927
Clay	35	536

Boston, 19th July, 1852.

During the month of June the market for copper stocks was much depressed, and many of the shares declined largely from previous quotations. In several of them no sales whatever took place, and the shares could be bought at very low figures.

The forced prices which were attained in April last by speculation have had an injurious effect with the public, who, having had their fingers burnt, are now doubly cautious how they venture a second time. Many of the companies which were then brought forward, and the shares sold out at several hundred per cent. profit, have since proved to be perfectly worthless, for the present at least, and it will probably be many months before they can be developed, if ever.

Such a course as this must naturally have its effect, notwithstanding there are copper companies that stand the test of *practical working*, and not on paper merely. The Minnesota and Pittsburg both have a foundation, not of sand but real copper, which is strong enough to sustain them in the estimation of a discerning public. Both these companies are doing a splendid business, and accounts from the Pittsburg (commonly called "Cliff Mine") are of such a highly favorable character as almost to stagger the belief of its most sanguine friends. Copper Falls comes next and ranks well. Although not yet sufficiently developed to become a dividend-paying mine, the present year's work gives promise that another season may produce a result so much to be desired, both as an evidence of its capacity, and for the benefit of its shareholders.

North American continues to progress successfully and maintains its market value very steadily. National is in good demand now at $31 per share bid, with a scarcity of stock in the market. Holders of these shares are looking to the future for still greater success, although at present the stock is worth more than fourteen hundred per cent. above the amount ($2 per share) yet paid in. We doubt if any mine in this country ever reached so favorable a result in the

first year of its operations. North Western is in good demand at 19½ to 20, although not much dealt in here.

Toltec is improving, both in the accounts from the mine, and in market value, the price having reached 14, which is an advance of $3 per share thus far this month. This stock is popular with speculators here, both large and small, and bids fair to advance, unless some unfavorable blast should be heard from the regions of Lake Superior. Forest, although very much depressed within a few weeks past, has now recovered its activity again, and advanced to 14 with much firmness. Some private advices from the mine have been more favorable of late, and the actual shipment of 7 tons of copper, has strengthened the confidence of operators and the public generally. Isle Royale is firm at 13 to 15, and the accounts from the mine are very favorable. Holders evince but little disposition to part with their stock. Norwich is not much in the market, but 9 is freely bid. The future success of this mine is considered beyond doubt by those best acquainted with the results thus far. Phœnix was very much depressed some weeks since, the price being about $8 per share, which was a falling off from 19 in April. Within a short time, however, sales have been made at 10, and the stock is in fair demand. Algomah is much inquired for at $4 per share, but the stock is held higher. The prospects are considered very fair. Ripley has improved, and now sells at $3 per share for $2 paid in. This company has been but a short time organized. Adventure has not sold for the past six weeks. The price is nominally about $6 per share, but reliable quotations are difficult to obtain. Bay State sells at $2 per share, Dana 2, Fulton 2, Glen 2¼, Manitou 2½ asked, Native 4½, Shawmut 1¾, Star 2, and Winthrop 2. No particular information from either of the above has been received here lately, and they may all be classed as of the prospective, rather than of present value. A portion of them will undoubtedly become more or less valuable, while others will be lost sight of in the course of time.

All of the above companies are situated in the vicinity of Lake Superior, and comprise nearly all ever dealt in here. The Manassos (in Virginia) is occasionally sold in this market, but is not generally known. The friends of it anticipate great results from its workings, however, and think it will rank with the best in due time. We have given a short review of each of the copper companies in the above list, and will now speak of the only two companies remaining.

The Malone Sandstone Company is situated in Malone, N. Y., and as its name implies, furnishes material for building purposes. Large contracts have been made for furnishing the stone, and the prospects of the company look highly favorable. The stone is very durable, being hard and yet easily worked, and of a handsome cream color, which imparts a pleasant appearance to structures composed of it. The nominal capital is $400,000, divided into 40,000 shares. The stock was paid in at $3, but has since declined to 1¾, speculators selling "short," and then breaking down the price in order to buy in at a profit. The West Castleton Slate Company is located in West Castleton, Vt., and produces a very fine article of slate, which is coming into general use. The nominal capital is $1,000,000, divided into 50,000 shares. The stock was paid in at $6. No sales have been made since May 18, at 6¼. The price is now about 5 bid, 6 asked.

BOSTON MINING SHARE LIST.

Fluctuations for June, 1853, in twenty-five different Mining Stocks, sold at the Boston Stock & Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

MINING STOCKS, BOSTON.	SHARES.	PAID IN.	HIGHEST SALES.	DAY NO.	LOWEST SALES.	DAY NO.	VALUE, JUNE 30.	FROM MAY 30.		SHARES SOLD.
								Gain.	Loss.	
Adventure, Copper,	10,000	$10,00	—	—	—	—	6	—	1	No sale.
Algomah,	10,000	,50	4½	1	4	22	5¼	—	¼	250
Bay State,	20,000	,50	2	1	2	8	1½	—	½	300
Copper Falls,	10,000	11,00	62	27	52½	9	60	4	—	687
Dana,	20,000	,62½	2¼	2	1	18	1¼	—	¼	1,529
Forest,	10,000	3,80	19½	1	11½	30	11½	—	7½	2,967
Fulton,	100,000	2,00	—	—	—	—	1¼	—	¼	No sale.
Glen,	10,000	2,00	3	4	2½	6	2¼	—	¼	129
Isle Royale,	12,000	3,50	—	—	—	—	12*	—	2	No sale.
Malone, *Sandstone*,	40,000	3,00	2½	1	1½	13	1½	—	½	12,475
Manassos, Mining,	100,000	—	4½	10	3	30	3	—	1	370
Manitou, Copper,	20,000	,25	—	—	—	—	3	0	0	No sale.
Minnesota,	8,000	22,00	210	1	204	27	205	—	5	16
National,	10,000	2,00	30	30	22	29	30	2	—	45
Native,	10,000	2,25	4½	3	4½	1	4½	0	0	46
North American,	10,000	17,00	71	9	70	30	70	—	2½	70
Norwich,	20,000	—	—	—	—	—	2½	1	—	No sale.
North Western,	9,000	10,00	20	24	19	29	20	2½	—	60
Phœnix,	10,000	5,00	9½	29	9½	29	10	—	2	15
Pittsburg (Cliff,)	6,000	18,50	—	—	—	—	165	—	5	No sale.
Ripley,	40,000	2,00	2½	3	2	23	2½	0	0	73
Shawmut,	20,000	,50	1½	1	1½	13	1½*	—	½	565
Star,	20,000	,50	2	4	2	4	1½*	—	1	50
Toltec,	20,000	3,00	12½	1	10	10	11½	—	1	4,482
Winthrop,	20,000	,75	1½	1	1	15	1½*	—	½	865
W. Castleton, Slate,	50,000	6,00	—	—	—	—	5½	—	1	No sale.

* Assessment paid.

The number of shares sold in June was much less than for the previous month. It will be noticed that no sales were made in five of the above companies, while in eight others less than 100 shares were sold in each. The market value does not compare favorably with the close of May.

It is not easy for those who are unacquainted with mineral districts to comprehend the value which is at once attached to localities where rich mines are discovered. The rise in the mineral lands of Lake Superior probably furnishes an extreme case of the kind. Some of the particulars from a highly creditable source we lay before the readers of the Mining Magazine.

The recent rapid advancement in the price of iron and copper in this and other countries, and developments made within a few years past in the Lake Superior region, have begun to have their effect on the price of these valuable mineral lands on the south shore of this lake. As the region of the mines was remote from the great thoroughfares of the country, and till recently difficult of access, it has been visited by but few who comprehended the value of the mineral wealth that lay stored in these northern hills; and though masses of pure native copper showed themselves in many places on the very surface of the veins; though hills of iron ore yielding eighty per cent. of the metal were scattered along the shore, and though the climate was peculiarly favorable for mining purposes, still capitalists have been slow in coming into this favored region of investment, until within two or three years past.

There never was a field of such mineral wealth so long neglected as this of Lake Superior. Quarter sections of copper and iron lands, that are now selling for from *ten to one hundred thousand* dollars each, were a year ago bought for

ten shillings an acre. The Cliff mine (Pittsburgh and Boston,) that is now turning out some 1200 tons of native copper a year, and paying or reserving each year two hundred per cent. on the original investment, is located in lands bought a few years ago for five dollars per acre. There are at least twenty-five mines on Lake Superior that would bring to-day *two hundred thousand dollars each*, and eight of the number could not be purchased for five hundred thousand dollars each.

The iron mountains are scarcely to be estimated in like manner—there is iron enough, and that of the best quality, to supply the wants of the entire country for centuries to come, and then wonderful deposits of this metal are beautifully situated in a wooded country, in the midst of a rich soil, with splendid streams, waterfalls and lakes, and all of these lands have been bought within half a dozen years at the Government price, or ten shillings per acre: now their value cannot be estimated. The proprietors of these copper and iron mines, when they first entered these lands, had but a faint idea of the fortunes they were securing for themselves and their successors. Thousands of acres of as valuable lands as are to be found in the country have remained unsold or unsecured till this season; but now the value of such investments is beginning to be better understood and appreciated by capitalists, and some *seventy-five thousand* acres in the several mineral and pine districts have been taken up within the past two months. There is no want of capital for investment in this promising field at the present time, and good mineral lands, and agricultural and timbered lands in the vicinity of the mines, have gone up several hundred per cent. this spring. A man who buys a good piece of mineral land at Government price, may buy a mine worth a hundred thousand dollars; and at all events he buys timber on it, to say nothing of the value of the rich soil, worth ten times the original cost. The value of the soil for agricultural purposes, and the value of timber, is a consideration which is but little understood at the present time.

The aspect of the Anthracite coal trade has not materially improved during the last month. The following from the Anthracite region, of the latest date, appears in the Miners' (Schuylkill) Journal:

Both the Lehigh and Lackawanna Companies have advanced the price of their coal on future contracts—and the operators here, we learn, will also advance the price of coal on the first of August, to correspond with the advanced rate of wages, which they are now paying.

The decrease from the Schuylkill region is 69,332—from the Lehigh 3,994 tons, making from the two regions a decrease of 73,326 tons in the supply this year. There remains but four months of the shipping season—and the *Mauch Chunk Gazette* says that "if there is no interruption, the increase during the season, from that region, will probably be about 75,000 tons." We have no data to draw a comparison of the trade from the Lackawanna region—but it is generally understood that there is no increase so far, if it is equal to the supply to same period last year. From this region, with a deficiency of 69,331 tons, and only 19 weeks remaining until the first of December, we can hardly promise any increase over last year up to that period, unless the men work more regularly for the balance of the season.

The Shamokin region will not open until some time in August. It may do a business of 50,000 tons this year—and about 150,000 tons next year. Paper calculations of a million of tons may do for speculative purposes, which is the course of all *regular business*, but time will show which calculation will approach nearest the truth.

Just as our paper was going to press, we received the following telegraphic dispatch:

We advance our tolls on coal fifteen cents per ton, on 8th August, fifteen cents more on 1st September, and ten cents on 1st October. JOHN TUCKER.

The Schuylkill Navigation Company, of course, will advance their rates accordingly.

JOURNAL OF GOLD MINING OPERATIONS.

The yield of gold from the mines and diggings throughout the world manifests no decline whatever in quantity. On the contrary, new mines are opened and new deposits of ore discovered. In the Peruvian territory the discovery of this metal has been recently reported; in New Grenada, where it is known to exist, exploring geologists have been sent out to examine the value of the mines and the facilities for working them; in Virginia and in North Carolina operations are commencing in valuable mines.

CALIFORNIA GOLD FIELDS.

The methods of mining now adopted in California may be divided into three classes: First, the original practice of digging up and washing the earth on, or adjacent to, the banks of streams. This has been followed with so much industry, that the method was some time since adopted, of digging canals to conduct the water from the streams, in some instances for miles through dry *placers.* The extent to which this has been done is far beyond the conception of those who have not visited that State.

The Mokelumne Canal Company's operations involve an expenditure of $250,000. The flume is eighteen miles long, four feet wide, and four deep. There are over fifty aqueducts from 500 to 1,500 feet long.

The new aspect which this has produced in the mining operations in the State is thus described in the *Alta Californian:*

It is now becoming a "fixed fact" that the gold in California is but just fairly discovered! that the gold region of the State is founded on auriferous hills, and that those portions which have been worked are different from the remainder in this respect. The gold on the surface has been set free, and in the course of ages, as the rains have washed away the dirt, the gold has worked into the gulches and creeks to a larger amount than has usually chanced to be in other places. These creeks were the first to get worked out, and many supposed that when the gold was exhausted in these places, there would be little left worth digging for. But it is now proved otherwise. In those sections where the diggings have proved richest, the hills, if they have been thoroughly prospected, have almost uniformly proved rich. Leads are found running in all directions through the hills, and it requires only close observation and good judgment to render the deep diggings not only reliable, but extremely profitable.

It was formerly thought that it would not pay to dig large and long tunnels, and if it was suspected that there was gold in any particular spot, it was the practice to sink a shaft, and by means of a windlass and bucket raise up the dirt, and in this way prospect the ground. By this means they could only prove a little spot with a great deal of labor; but since the faith in deep diggings is so improved, they confidently strike in at the side of a hill, and drift away till they find something, which they always do, if they continue long enough. Sometimes, they work month after month with very little show, and lo! when least looked for, perhaps, they strike the rich deposit that repays them for all their labor.

The *Placerville Times* alludes to the same subject in these words:—

Now that the rains have ceased and the ravines are becoming dry, there is an increased demand for water from the various canals and ditches within the

limits of our county, for mining purposes. The position of those who had predicted an entire change in the mining season, throughout the artificially watered portions of the mining districts, is being fully verified. Instead of the rainy season being the principal and best for mining. hereafter the long days of summer with its bright skies will be the miner's harvest season. Consequent upon this will be a corresponding continuance of the business season of the tradesman and mechanic, giving activity and stir to a season of the year heretofore the most dull and inactive. That there is no lack of new, rich, and untried placers within the range of the several water companies' works, no one can doubt; not a day passes that new diggings are not discovered, and the constantly increasing amount of dust brought to our city for exchange, is proof positive of the general success and prosperity of the miners of El Dorado county.

Among the rich hills of Nevada county, in the Northern mines, a new method adopted is thus described:

A new method of mining in hill-diggings has lately been introduced in this place, as novel as it is efficient. The usual cut is made from the outer edge at the base into the centre of the hill. From a reservoir on its summit (made with a barrel, to preserve a steady pressure) the water is conducted by a leading hose of strong canvas, terminating with a pipe, similar to that of a fire-engine. The column of water thus produced ranges from twenty to one hundred feet, according to the height of the hill. The pipe is taken into the area of the cut and brought to bear upon its sides; and such is the immense power of the water as it escapes from the pipe, that no alluvial deposit can resist the force for an instant. The toughest clay dissolves like wax, thus disintegrating much fine gold, a greater part of which has heretofore been lost. The excellence of the plan and the wonderful celerity with which the work progresses, must be seen to be appreciated. Fancy a huge boulder, weighing several tons, lying midway in the side of one of those cuts, held there by a deposit of sand, gravel, and clay, hard enough to require a pick in the hands of an ordinary workman, to be sharpened once or twice daily. Then witness the operation of the new appliance: the hydraulic apparatus is brought in contact with the *debris* encircling the boulder, which melts like ice under a midsummer sun, and lo! in much less time than it requires to describe the operation, the huge mass is released from its diluvian home, and comes tumbling down into the space below. The advantages of this important auxiliary to "sluicing" are: 1st, the reduction of manual labor at least two-thirds; 2d, it opens to miners locations heretofore unremunerative, where they may now realize handsome returns, consequent on the great additional quantity of auriferous soil that may be washed within a given time; and 3d, the dangerous process of "undermining," with the fatal results which frequently attend it, may by this new invention be entirely obviated, as the operator can at all times be wholly out of the reach of the overhanging embankments.

It will appear somewhat strange to those who believed but a short time since that every thing about this mountain city gave indication of a rapid decline, to learn now that Nevada, since its settlement, not even in the palmy days of 1849 and 1850, was ever in a more flourishing and prosperous condition than at the present time. Unmistakable evidence of a steady, onward growth continually greets the eye.

In the reports from the Southern mines, the supply of water by ditches and canals is also spoken of as most important:

With June the dry season seems fairly to have commenced. It has been waited for impatiently by some who have claims that can only be worked during the dry part of the year. But, notwithstanding the loss of time that the long-continued rains have caused to the owners of such claims, and the injury that will result to those who are depending on the beds of the rivers, I

think the great body of miners and the community generally are and will be benefited on the whole, as a much larger number of men can find employment on the dry diggings, now that they are well supplied with water from the various ditches, than could have done under other circumstances.

The other method of mining in California, that of working the veins found in the quartz rock, has been already carried to a sufficient extent to prove that it can be done with profit.

Stamps, with all their disadvantages, have proved to be the most profitable machinery thus far used at the gold mines, for crushing the rock. The process of amalgamation still remains, however, imperfect and attended with considerable loss of the metal.

A correspondent of the *New-York Tribune* of June 30, under date from Grass Valley, Cala. March 27, says:—

"Of the American quartz mining companies, none stand higher than the Helvetia and La Fayette. Under all the disadvantages of the season, which prevented quarrying, the mill of this company has run profitably most of the time. At present but one set of nine stamps are in use twelve hours per day, and these nearly worn out. The result is, from surface rocks mostly, an average profit of about $600 per week. With new stamps now being put in, and ore from the main 'lead,' the net profit will soon be over $2000 per week, and not unlikely, as heretofore, come up to $5000 some weeks. The stock of this company is worth *par*, and will pay dividends every three months."

Later intelligence from the same company informs us that for the two months preceding the 1st inst., their workings, still upon "surface rocks and tailings," had averaged $1100 per week, and they were at that date putting on a double set of hands, and were about commencing work upon the vein, which was then sufficiently free from the water accumulated by the severe freshets to admit of working. For particulars of this company see last page of the Magazine.

AUSTRALIAN GOLD FIELDS.

There has been a temporary diminution in the product of the gold fields since the time when the act of government for raising a revenue, went into operation. The Melbourne Herald, of April 7th, presents the following account of the gold brought to that place:

The amount of gold brought down by escort during the last six months, shows a progressive and considerable decrease on each period of four weeks.—The amount thus received was as follows:

		Ounces.
Four weeks ending	13th Nov.—1852	314,141
Do.	11th Dec.—1852	209,153
Do.	8th Jan.—1853	187,954
Do.	5th Feb.—1853	185,469
Do.	5th Mar.—1853	168,620½
Do.	1st Apr.—1853	151,814¾

Gold is brought in, by government escort in weekly trains. The fear of the numerous bands of bush-rangers who roam the country intimidates the laborers from trusting their treasure either on their persons or by any other conveyance than that guarded by government troops.

How far the New License Act, operated to cause a decline in the product it is

not easy to determine. It raised an intense excitement, wherever it was attempted to enforce its provisions. The mining population were ready for almost any movement, in consequence of this, as they think, tyrannical act. At the Turon, meetings were held expressive of public feeling, and the Sydney *Empire* says:

Another meeting was held on Tuesday. About 700 to 800 persons attended, when a resolution was unanimously passed amidst loud cheers, calling upon all the miners to suspend operations on Monday, the 7th proximo, and to assemble together at Sofala, at 10 o'clock A. M., when a deputation will be chosen to wait upon Her Majesty's Gold Commissioners to hear their opinions with respect to the enforcing of the act, and if it is their intention to carry it out, the whole of them *en masse* will deliver themselves into the custody of the authorities, for pay the license they will not.

The same paper adds that "one general feeling of indignation pervades the miners of the western districts." In the anticipation of tumult in consequence of the acts of government, it adds:

We want no war—above all, no civil war. We are for peace, but accompanied it must be by liberty. Already have reports been industriously circulated, that if the storekeepers pay the licenses, a firebrand will be set to their residences. We want no smoking ruins, nor spilling of Australian blood, shed by Australian arms! We would urge upon the government not to enforce this iniquitous act, and thus to tranquillize these districts, and restore confidence and loyalty in the minds of the miners.

All the estimates of the product of the Australian mines for 1852 vary somewhat in the total result. We add the following estimate by Edward Kuhll, a bullion broker at Melbourne; although varying from previous reports, it is more full in details than former ones:

Quantity of gold dust brought to Melbourne and Geelong.—By Government escort. 1,339,845 oz.; by Victoria Escort Company, 821,143 oz.; by private hand, 601,648 oz.

Shipments of gold from the ports of Victoria.—From Melbourne, 1,886,217 oz. 5 dwt.; Geelong, 84,020 oz. 14 dwt.; Portland, 3,039 oz. 7 dwt.; Port Fairy, 1,690 oz. 7 dwt.; total, 1,974,975 oz. 13 dwt.

Amount of gold dust remaining at the 31*st of December, in the Treasury.*—Melbourne, 83,678 oz.; Victoria Escort Company, Melbourne, 58,982 oz.; banks in Melbourne, 330,000 oz.; banks Geelong, 135,000 oz.; private hands in Melbourne and Geelong, estimate 130,000 oz. Total, 787,660 oz.

Quantity of gold dust taken to Adelaide.—By overland escort, March to December, 1852, 228,533 oz.; shipped from Melbourne, 17,331 oz.; taken by private hand, 178,160 oz.; estimated quantity taken in addition to above, 166,687 oz.; shipped from Adelaide to London, February to December, 1852, 263,564 oz.

Amount remaining in the banks, assay office, and private hands at Adelaide, 299,816 oz.

Quantity of gold taken to Sydney in the year 1852.—Shipped, per Melbourne Customs' returns, 280,589 oz.; by private hands, 341,739 oz.; estimated quantity taken in addition to the above, 100,000 oz.; quantity held by the banks and private hands, 150,000 oz. Total, 872,328 oz.

Quantity of gold dust taken to Van Diemen's Land in the year 1852.—Shipped, per Melbourne Customs' returns, 1,953 oz.; taken by private hands, 140,546 oz.; estimated quantity held by the banks and in private hands, 50,000 oz.; shipped from Launceston, per Customs' returns, 36,946 oz.; estimated quantity held by the banks and in private hands, 20,000 oz.

Summary of produce during the year 1852.—173 tons 19 cwt. 1 qr. 12lb. 3 oz. at 70*s*. £14,163,364, exclusive of gold dust in the hand of diggers, storekeepers, and others, and on the road to Melbourne and Geelong.

The following statement made on March 19, is for 1853.

	Ounces.
The Government escort brought from Mount Alexander and Bendigo	11,016
Balaarat, including that left at Geelong	3,905
The Ovens	4,920
The Victoria Escort Company brought from Mount Alexander and Bendigo	10,263
Total	36,104
Gold previously shipped from Victoria, in 1853	514,715
Per Melbourne steamer to London, additional	24,309
Per Cleopatra, to Sydney	2,300
Per Queen of England to London	40,395
Per Enchanter, from Geelong, to do.	21,000
Total	602,719
Or 25 tons, 2 cwt. 1 qr. 1lb. 7 oz., at 75*s.*	£2,260,105

Another account says:

Up to the beginning of March the exportations had aggregated more than nineteen tons weight of pure gold. Another piece of interesting news is the discovery of coal in unlimited quantities at Portland, at the very surface of the ground, a few miles in the interior, besides sure indications of coal in the immediate neighborhood of the town. The stream of immigration into Melbourne and Geelong was uninterrupted, and, notwithstanding that a huge city of temporary buildings has sprung up like mushrooms, there was much suffering for want of shelter.

NEW ZEALAND GOLD FIELDS.

By the arrival at Singapore of the ship Slaines Castle, late advices had been received from New Zealand. The colony had been thrown into a state of feverish excitement by the finding of prodigious quantities of gold, and the most incredible accounts are averred to be without exaggeration. At Coromandel Harbor there was an abundance of the precious metal. At the Canterbury settlement gold had been discovered and worked in considerable quantities. The discovery, also, of a copper mine within eight miles of Nelson, where the lode was six feet in width, has greatly augmented the excitement. The gold yields at Auckland were considerable. The shipping were almost deserted by their crews, and the captain of the Slaines Castle was compelled to pay 40*l.* on the capstan-head to each seaman to work the vessel to an Indian port.—*London News.*

THE GARNETT AND MOSELEY MINES, VIRGINIA.

A recent number of the Richmond Enquirer, contains some interesting facts relative to the gold mines in Virginia, especially those in Buckingham county. The Editor, it appears, made a trip of exploration, and the result was to bring out some facts that were very little known by the public. We take the following statements from his pen:—

It is a singular fact that, in the very midst of the prevailing excitement in regard to the gold mines of California and Australia, and at the very time when it is announced in London that gold is picked out of surface cuts in the latter country in lumps of 120 lbs. weight, English companies are purchasing large gold properties in the county of Buckingham in Old Virginia. The explanation of the anomaly is simply this. It is demonstrated, beyond question, that gold mining, *as a business*, can be most profitably conducted in this State, with a proper outlay of capital in machinery and excavations.

This is all that John Bull wants to know. He knows that mining, or rather gold hunting, is still an adventure, a lottery, a game of hazard in the new Eldorados,—that prices, as well of labor as of all things else, are, in California and Australia, high, fluctuating and unsteady; and that nothing in those countries partakes of the nature of settled *business;* but every thing of *gambling* or *adventure;* so John Bull invests largely in the gold mines of Virginia, where the law is supreme, where government is strong, where institutions are conservative, and where *prices are steady*, and leaves speculation. gambling and luck to be pursued in California and Australia, by *adventurers* of which he is not one.

It is a fact not generally known that there runs, along the whole Atlantic slope of the United States, east of the Alleghany Mountains, from Maine to Georgia, in the direction of northeast and southwest, an auriferous belt of country, some two or three hundred yards in width, bearing golden ore in a large portion of its course, too poor to be worked with profit; but at many different points, as in Spotsylvania, Fluvanna, and Buckingham counties, Virginia; Charlotte in North Carolina; and Dahlonega in Georgia, concentrating into veins of remarkable richness.

The mines of Charlotte and Dahlonega, are well known, and have been so very productive, as long ago to have induced the establishment of branch mints in their vicinity by the General Government.

The mines of Fluvanna in this State, have been worked for several years by Commodore Stockton, with very superior machinery and a very considerable outlay of capital, but how successfully, we know not.

The mines of Buckingham county have been worked superficially for many years. They have recently been made the subject of very minute and thorough geological surveys by English mineralogists, and have elicited from these scientific men very flattering reports. The celebrated Professor Ansted of London, who recently published several letters in the *London Times*, wrote from personal observation made during a visit of exploration to some of the coal beds in Western Virginia, and these Buckingham gold mines in Eastern Virginia. He examined and explored the mines in Buckingham, known as the "Garnett and Moseley," and reported very strongly in their favor; but did not examine either of the other mines in that county.

The mines in Buckingham, have for the most part, been worked rudely and superficially for many years, almost wholly from the surface; or if shafts were sunk, they were only sunk to the level of water, and there abandoned, at the very point where the veins are now found to become richest. Yet, though worked thus rudely and superficially, altogether by native labor and with little mining skill or experience, they have all paid well. Some of them have yielded large amounts of gold; and many hundreds of thousands of dollars have been extracted in the county. The veins upon the mining properties are rich and productive from the surface; but concentrate and become richer as they are sunk deeper. Not only is gold obtained from the veins, but the beds of many of the streams have been worked for considerable distances, and large amounts of the metal have been thus derived. The ravines of these streams are said, by persons who have seen both, to precisely resemble the placers of California.

From these general remarks as to superficial and rude working must be excepted of late the "Garnett and Moseley mines," which lie near the foot of that singular geological phenomenon, the Willis Mountain—an immense mass of rock standing solitary and alone, in an undulating Piedmont country, doubtless the work of volcanic convulsion. Geologists suppose that the superior richness of the gold veins in Buckingham has been the result of the same volcanic action which has created this huge solitary mass of rock.

The Garnett and Moseley mines have had the fortune of belonging, most of the time, to larger capitalists than the other mines of the county, and have consequently been much more extensively developed. They have recently been purchased by a wealthy English company, who are making a very considerable additional outlay upon them. Machinery has been erected of the most exten-

sive and efficient character, for reducing and washing the ore, for pumping water from the subterranean galleries, and for raising the ore. Two steam engines, each of thirty horse power, are now constantly at work, and to these is soon to be added another of sixty horse power, with all which it is intended to drive forty "stamps" (mortars for pounding the ore into powder), and one or two of Cochrane's crushers, a powerful machine recently invented for the same purpose.

This company's mines embrace a tract of some thirteen hundred acres, and contain several veins which have been "proved," in different places, by probably as many as fifty cuts, tunnels and shafts for a distance of half a mile.

At the point in the property at which the machinery is located, and at which the operations are conducted, shafts have been sunk upon the principal vein, which is of quartz, one hundred and ten feet, at which depth the vein is fifteen feet in thickness. In most of the ore taken from it the gold is invisible, but when reduced, yields $15 and upwards per ton, say an average of $20 to $25 per ton. But in many portions of the vein the ore appears in visible lumps, in a native, pure state. These portions, called "specimens," are selected and kept together in a "specimen room," and when reduced yield, often, several thousand dollars per ton. In some of these specimens the gold is so pure that it can be bent, or broken off with the finger.

The mining operations of the company embrace five shafts, sunk to an average depth of a hundred feet. One of these is an old one, containing a comfortable stairway leading down to the coolest region we have explored for a month. Two other shafts are used as ventilators, and two others for hoisting the ore and pumping up the water, of which a sufficient quantity is derived from beneath to supply the engines, and employ the amalgamators which work the metal. Two of these shafts have been sunk within a few months past, are situated immediately upon the principal vein, and have supplied the large quantity of specimens containing visible gold before referred to. · This principal vein is nearly perpendicular, and has been tested for a half mile, at various points upon its course, by four or five other trial shafts varying from 30 to 50 feet in depth. Thus, there is ore "in sight," as the miners say, sufficient to employ operations, on the most extended scale, for many years. So great is the richness of the vein in the lower portions of it now reached (and it becomes richer the deeper it is penetrated), that a regular system of police is established to watch the mouths of the shafts, as the ore comes up, and to search the miners as they are relieved from duty. Between twelve o'clock on Saturday night and twelve o'clock on Sunday night, the period of suspension of operations, the mouths of the shafts are closed by lock and key, and guards mounted over the hatches.

Underground, there are galleries of some 350 feet in extent, which form a communication between the shafts. Slope workings along these galleries have been made with the same profitable results as in perforating the vein perpendicularly.

Besides a good staff of engineers, about seventy negroes are employed by the company, who are hired from the people of the county. The company are now sending out from England a good supply of practical miners, in addition to those already employed. Besides the "specimens" mentioned as deposited in the "specimen room," immense piles of ore lie above the surface, amounting to many hundreds of tons, which are daily receiving large accessions from the operations below. Though the gold in these piles of ore is invisible, they are so rich as to require a constant day and night watch over them, to guard them from depredators, who, when successful, calcine the quartz, separate the gold, and sell it to the hucksters furtively located about the country.

The settlement has the appearance of an active, thriving village, and presents a scene eminently worthy of a special visit from those who feel an interest in the advance and prosperity of the mining interest of Virginia.

Three other mines in the county, the Wiseman, the Eldridge, and the Morton or Hobson mines, lie upon the same auriferous belt of country in the same

northeast and northwest course, and probably upon the same vein as the "Garnett and Moseley." They have always been worked with profit; but when they shall have been as fully and elaborately developed, and as extensively worked, as the Garnett and Moseley, there is reason to believe that they will prove far more productive and valuable than ever. A paragraph has recently gone the rounds of the press that the two first of these mines have been recently sold to English capitalists, which we understand is the fact. If so, a large working money capital will at once be employed upon them, adequate to their complete and thorough development, which is the only policy that can succeed in the mining operations of this or any other country.

It has only been since sufficient capital has been invested and experienced miners employed in the mineral regions of the United States, that the mining interests of the Union have been any where at all successful, notwithstanding the richness of our ores. Without these necessary conditions, richness of ore is in general of no avail, except to keep up a meagre, sickly and barely profitable system of operations.

It is greatly to be desired that foreign mining capital and skill, having thus found a footing in Virginia, will soon discover the numerous other minerals and localities offering profitable employment, with which our State abounds, and that our State's immense mineral wealth now hidden in her bowels, will thus be extensively explored, and rapidly developed, contributing new wealth, creating new enterprise, adding new resources and imparting new energy to all her great interests.

LONDON AND VIRGINIA GOLD MINING COMPANY.

The "London and Virginia Gold and Copper Mining Company" is also in course of formation, with a capital of £50,000, in £1 shares, and constituted under a charter of the State of Virginia. The company, however, is purely English. Veins of copper, gold, and silver, are stated to run through the property secured, which is in the vicinity of the Garnett and Moseley, Liberty, and other adventures known in this market. Assays, stated to have been made from fairly selected samples of the ores, show very good results. The terms for the purchase of the "Eldridge mine and estate," and the benefit of other contracts, are £10,000 in cash, £10,000 in paid-up shares, and a further sum of £10,000 in shares to be deliverable so soon as a dividend of 10 per cent. shall have been paid to the shareholders. No payment is to be made to the vendors till the representations made have been verified by the company's agents. It is stated that all the shares have been already applied for, and that the project will consequently not be publicly advertised.—*London Daily News.*

FREEHOLD GOLD MINING COMPANY.

A new Virginia gold mining undertaking is announced, under the title of the "Chancellorsville Freehold Gold Mining Company," with a capital of £50,000, in £1 shares, fully paid up. The property proposed to be worked, the prospectus states, is situated in Orange county, and consists of 439 acres of land. At present only one vein has been opened, but near this is stated to be a strong quartz vein, 20 feet in width, which can be traced for a mile and a half. It is stated that two gentlemen interested in the purchase have already proceeded from London to Virginia, accompanied by Mr. Henwood, F. R. S., &c., and have examined the property, bringing away samples of the ore, which, on assay, are stated to yield very advantageous results. Between 500 and 600 tons of ore have been raised, and are now the property of the company, awaiting reduction. The vendors are to be paid a royalty of $\frac{1}{15}$th upon the profits and 18,000 shares, of which 6,000 are to be handed over at once.—*London Daily News*, June 20th.

BRAZILIAN NATIONAL MINING ASSOCIATION.

This company held a meeting in London, about June 20th, for the purpose of considering the propriety of winding up or of taking vigorous measures to develope the land and mines of the company:—

The Chairman (JOSIAH BATES, Esq.) informed the meeting that the company possessed about 200,000 acres of the best land in the Brazils, exclusive of the mines. The Cocaes was an agricultural and mining estate. On this estate a lump of gold was discovered weighing 48 lbs., and one of the previous Brazilian owners extracted, by the aid of four negroes, gold to the value of £20,000; in another corner of the estate, gold to the value of £4,200 was extracted in nine days by some laborers. The Macautas estate was about three miles in breadth and five miles in length, where there were two mines unworked by the company. From the Cuiba property a larger yield of gold from auriferous stone might be obtained than was obtained from the St. John Del Rey workings. The Ketuto estate consisted of 170,000 acres of the most valuable land in the Brazils, capable of growing cotton and indigo in great profusion. The whole of the small town of Ketuto belonged to the company, where several manufactures were established. The great source of wealth upon this estate would be the river Sipo, which was said to contain diamonds, for numbers had been picked up on the banks, in places where the waters had receded, by the *employés* of the Brazilian government. This river had been undisturbed for twenty years. It was thought that by the employment of a dredging machine this river would be found to be extremely rich both in gold and diamonds.

PETRIE'S PATENT GOLD-REFINING PROCESS.

The new method of conducting the refinement of gold, described by Mr. Petrie in the specification of his patent, is directed to the improvement of the process termed "parting," and exhibits another application of a valuable principle of operation, to which he has given the appellation of "differential."

According to the specification, the "refiner's alloy," consisting of one part of the impure gold and three parts of silver, granulated in the usual manner, is first placed in a series of six or more small cells or cylinders, which are placed upright in beds or cradles, resting upon and between two parallel rails, which form an incline; and, if desirable, these can be made to form the sides of a flue, whereby the cells are warmed while in action; or, without the flue, the cradles may be of non-conducting material, and surround the cells to maintain the heat. Hot nitric acid is kept continuously dropping from the top into the highest cell, and having passed down through the whole mass of the alloy, and through a perforated false bottom, ascends through a tube, or at the opposite side of a diaphragm, fixed vertically in the cell, to a lip at the top part. From this it overflows, and drops off the side into the next cell on the incline, which stands upright close to it, but about two inches lower. The nitric acid thus makes its way through this arrangement of successive cells, which is termed "a gradient series." From time to time a new cell containing fresh alloy is added, in a cradle, to the bottom of the series, which is then moved bodily up the incline, by a simple and suitable mechanism, through the space occupied by a single cell: so that each cell is made to move into the position occupied by the one previously next above it, and the upper cell is removed. This process being continued, it is clear that each cell gradually travels up the incline, while the nitric acid moves downwards through them; and thus each cell, with the alloy it contains when first put on the incline, receives the nitric acid after it has descended through all the others, and becomes partially saturated with silver. This liquor, however, is still sufficiently active to operate on the fresh alloy, the surface of which is rich in silver; and if it contained a greater proportion of free nitric acid, it would pulverize the gold itself, by acting too energetically on the fresh alloy. Refiners obviate this in the ordinary process, by using a weak aqueous solution of nitric acid to remove the first portions of silver from the alloy, and then dissolving the remaining portions of silver, which are more difficult of solution, by a second and distinct operation, with stronger acid. A much more perfect adjustment of the energy of the acid to the state of the alloy is obtained in every stage of the "parting" by Mr. Petrie's patent differential mode of bringing the acid and the alloy into contact; a mode which has, moreover, the merit of being a single and

continuous process, in which, as we have seen, the alloy moves upward and encounters stronger acid, just in proportion as the alloy loses its silver, and so the less easily parts with what remains of it, until at length the alloy reaches the top of the series, where its last traces of silver encounter the acid in its freshest and strongest state, are rinsed out by it, and leave the pure gold behind. On the other hand, the nitric acid leaves the series at its lower end, most nearly saturated with silver. This completely effective action is secured with the utmost economy of acid, and not by dint of using the larger excess of acid which would be necessary to do the work with equal efficiency by the ordinary process.

The peculiar nature and advantages of the general principle of differential actions, of which we have a good example, are fully defined in the specification of the patent. Its general object is the effecting of a change in two things by their mutual action, when portions of them are brought into contact gradually and successively, by making them pass through one another in opposite directions. The result of such an arrangement necessarily is, that at every point along the line of action, they meet one another only in such relative states that their action on each other is but slight; but the action being continuous and progressive, they emerge at opposite ends with contrary changes effected in each to the greatest degree. By the ordinary modes, on the contrary, of bringing such materials into contact, with a view of effecting mutual changes, the completeness of the change in one of the materials can only be gained by expending an excess of the other material, and so foregoing the completeness of its change.

As the cells containing the refined gold in its spongy state are removed from the top of the differential gradient series, they are placed at the bottom of a new series exactly similar—excepting, that instead of nitric acid, water is continually dropping in at the upper end. By this means, the remaining acid and salt of silver are rinsed out; and this being done differentially, the rinsing is most complete, at the same time that the adhering acid and salt are withdrawn from the gold with the least possible dilution of water.

In the next stage of the process covers are fitted to the first-named series of solution-cells, to confine the nitrous fumes arising from them. These covers fit loosely, but internally, so as to trap the gas by the acid itself within the cell, thus securing the useful principle of the water-lute without its complication. The fumes are thence conducted, by stoneware tubes, through an apparatus, called a gas collector, into an oxidator. There are some novelties in the arrangements of these subordinate parts, and no luting is needed. The fumes are drawn off by an internal suction from the end of the oxidator, so that any imperfect or loose fittings in the parts are a positive advantage, by improving the oxidation, instead of being fatal to the efficacy of the apparatus, and causing a nuisance from the escape of the fumes, as is the case with similar arrangements which have been lately proposed in some other departments of chemical art.

The patentee does not claim the general application of the principle of the oxidator, but the apparatus he specifies and claims is altogether new and an improvement on existing means. It consists of a column of hollow stoneware cylinders of an improved shape, fitted loosely with coarse, rounded silicious sand, having its grains of a uniform and particular size, to secure the utmost effect with the smallest apparatus. The specification describes a definite rule for determining what this size should be in any particular case. The sand may be so obtained by means of one of the recent gold-washing machines, for which a new use is thus found. New arrangements are described also for admitting the fumes and air at a lower part of the column, and for securing a slow and uniform dispersion of water over the upper surface of the sand. A draught of suction is at the same time created (as by connection with a powerful chimney draught), which draws the fumes through the apparatus, and reconverts the whole of the fumes into strong nitric acid, which flows out from beneath in a continuous stream, ready for further concentration or for imme-

diate use. The sand being prepared as specified, does not arrest the draught as ordinary sand, or even gravel, or a coarser-crushed material would. The peculiar combining powers of the solid silicious surface in contact with air and water,—by which means the most extensive oxidating effects are produced in nature,—are developed in this apparatus to a greater extent, for the combining surface of the grooves in a cylindrical apparatus twelve feet high and one foot in diameter, is several thousands of square feet; and this is kept in a state of the utmost chemical activity by the direct impinging of the gases against it, by the action of the water on the contrary direction, and by the thinness of the film of the water between the combining surface and the gases. The vent of the draught from the apparatus is stated to be practically inoffensive.—*London Mechanics' Magazine.*

INCREASE OF GOLD.

The Boston *Atlas* has an article on the increase of gold, which contains much interesting information on the subject. It appears that for half a century before the discovery of the American continent, the annual product was not more than $1,500,00C. About the middle of the 16th century the mines of Potosi were opened, and from that time to 1700 the increased supply came principally from America, and averaged annually from $1,500,000 to $2,000,000; making the annual product of the world during that period between $3,000,000 to $4,000,000. This supply went on increasing for a century, when in 1800 the annual product of gold and silver had reached $48,000,000; about 70 per cent. or $33,600,000 of which was silver, and the remaining 30 per cent., or $14,400,000, gold. Of this sum America furnished about 90 per cent. of the silver, and 58 per cent. of the gold.

"From about 1810 to 1836 the supply of the precious metals from Europe and America had fallen off some 20 per cent. This arose from the fact that some of the mines had become exhausted, but more particularly from the wars on the continent, and the disturbed and unsettled state of Mexico and South America, where some of the richest mines were found. But during this period, mines were opened in Siberia, and Russia became the great gold producing country of the world. These mines, which in 1816 produced only about $50,000, had increased in productiveness till in 1836 they yielded $14,000,000. In 1848, the period when gold was discovered in California, the annual production of gold and silver had arisen to $82,000,000—of which $38,300,000 was in silver, and $44,700,000 in gold. At this period, America produced about 70 per cent. of the silver, and only 21 per cent. of the gold. It has been estimated that the total amount of the precious metals in the world, at the time of the discovery of the mines of California, was $7,650,000,000—of which about one-third, or $2,550,000,000 was gold.

"Since the working of the mines in California, there has been a rapid increase of gold. Up to 1852, it has been estimated that the gold from California alone would amount to $153,000,000. There was coined at the United States mints in 1852, $52,240,000; and though a small portion of this may have been obtained from North Carolina and Georgia, and another small portion may have been a recoinage of foreign gold, yet it is believed that as large a quantity of California gold has been used in manufactures as all the coinage of foreign gold, added to what has been obtained from Carolina and Georgia. We will, however, drop the odd numbers and set down the amount at $52,000,000. The quantity of gold dust sent from California to Great Britain and other foreign countries during the same years, must have amounted to at least $12,000,000—making the production of California for 1852, $64,000,000. Some have estimated it much higher. From present appearances the quantity from California the present year will be increased rather than diminished. We will set it down at $66,000,000. We will also suppose that Australia and Siberia will yield $44,000,000 more; we shall then have an annual production of $110,000,000 of gold, over and above the ordinary product from other parts of the world."

JOURNAL OF COPPER MINING OPERATIONS.

IT is hardly possible to keep pace with the Copper Mining operations, during the month. The progress of the older companies, and the enterprises of the new, have been unusually extensive.

LAKE SUPERIOR COPPER REGION.

The operations on Lake Superior are more extended than elsewhere in the country. This mineral region, in a physical point of view, is one of much interest, not only on account of its volcanic character, but from the fact that of all the Copper Mines which history has made known to us, in none other has the native metal been found in masses of such magnitude and purity. This region as far as surveyed geologically extends to the southern shore of the Lake, from Chocolate River, about 87° 20′ longitude, west from Greenwich, to 90° 40′, on the Montreal River, the boundary on the Lake between the States of Michigan and Wisconsin. This includes the iron region of Carp River, or Marquette, which, in the richness and quality of its ores, rivals all that the world can show elsewhere.

The copper has been found disseminated throughout this region, but chiefly occurs in abundance on Keweenaw Point, the Ontonagon River and Isle Royal. The same general formation extends to the lake shore, and copper in the shape of boulders has been found abundantly at the boundary on the Montreal River.

Some very valuable particulars respecting the state of the operations at the Copper Falls Mine have been furnished to the Lake Superior Journal by the agent of the mine. They comprise, the number and depths of the shafts, expenses of work, &c.

On the East or Copper Falls vein seven shafts have been commenced, embracing a distance of 2,350 feet on its course.

They are numbered both ways from the east of the hill or No. 1, No. 5 being at the adit level, and No. 6 to the south of No 1, 750 feet.

Shaft	No.	5	at the adit	level is	66	feet	deep.
"	"	4	"	"	67	"	"
"	"	3	"	"	115	"	"
"	"	2	"	"	149	"	"
"	"	1	"	"	202	"	"

Nos. 6 and 7 have just been commenced.

The adit level is 1,250 feet in length from shaft No. 5 to shaft No. 1.

The twenty fathom level in shaft No. 1 has been driven southward on the vein 280 feet, where masses of copper are met with. This level is 10 fathoms above the adit level. In this and in the 10 fathom level there are masses in view both ways from the shaft.

On the "Hill vein," which is half a mile west of the Copper Falls vein, there are five shafts along a line 1,555 feet in length.

Shaft No. 1 of this vein is near the adit level on the northern slope of the mountain, and is 150 feet down.

Shaft No. 2, 107 feet down, No. 3, 112 feet, No. 4, 130 feet, and No. 5, 80 feet in depth.

It is in shafts No. 4 and 5 that the large masses are found of which reports have been before the public.

In shaft No. 7 of the east vein a heavy sheet of copper is seen at the bottom of the ancient pits, which extend on both veins as far as they have been worked. Shaft No. 6 of this vein is near the intersection of our east and west vein or cross course on which the ancients have wrought extensively, and which promises to pay for working. It is a chloritic band parallel with the bedding of the rocks, and is well filled with sheet copper and lumps.

The masses that are visible in shaft No. 5 of the Hill vein are so compact that the shaft could not be sunk on the vein. In going down at the side of the mass it was found to be twenty-nine feet to the bottom, and extends each way on the vein out of the shaft.

We are permitted to give from the monthly and yearly accounts of work for 1851 and 1852 the following items of work and the cost:

On the East Vein for 1851.

Number of feet of Drift, ...	966
" " Shaft, ...	345
" of Fathoms of Stoping	8

Hill vein, 1851.—Drift 277 feet—Shaft 84 feet—total drift and shaft 1672 feet, at a cost of $11,740. This is for mine work only. The cost of surface work on the premises, including buildings, roads, etc., was $6,184.

Expenses for 1852.

East Vein—	Drift, 1,117 feet, cost,	$6,140
	Shafts, 146 " "	1.514
	Stoping, 101 fathoms,	1,085
Hill Vein—	Drift, 1,528 feet, cost,	6,971
	Shaft, 496 " "	5,840
	Stoping, 41 fathoms,	448
Mining expenses for the year 1852,		21,648
Surface " " " "		11,264
		$32,912

We have reliable data for fixing the expense of shafts and drifts in this rock.

In the expense of shafts the above figures represent every thing chargeable to the work. In the drifts some of the earth or broken rock is carried out of the drift by surface men, but only in a few cases, so that the above sums embrace all the material cost of driving the adits and the galleries or levels.

The average of the levels is $496, four dollars and ninety-six hundreths per foot running measure.

For shafts the average is $11,45, eleven dollars forty-five hundredths per foot of depth.

The adits and levels are four and a half feet wide, by six and a half feet high. The shafts are six feet by ten.

On both veins the mining grounds towards the south in the main body of the mountain improve rapidly in richness. The beds of trap, penetrated by the levels, on these veins, are similar in composition, showing that the ground is, for the space between the veins, three-fourths of a mile, quite regular. The openings, during the past winter, on this location, have added much to our knowledge of the veins of Point Keweenaw.

We can now get the true bearing of the veins along a line more than 2,000 feet in length, and also determine their average width and thickness.

The results here show the value of a board of directors who take liberal and enlarged views of mining operations.

On the suggestion of the agent, they have expended money freely, not with a view to the quickest returns, but with a view to the best results for a long operation.

A recent letter from this location thus describes the prospects of this mine:

Several new buildings have been erected and others are in progress, all of a permanent character. The heaviest shipments will be in October, as we cannot get out some of the large masses till late in the season. A large amount of stoping must be done before they can be taken down.

The Waterbury Mining Company is at work on the location of the ancient miners, who a thousand years since wrought copper. At the depth of 50 and 60 feet, masses of 400 and 500 pounds are said to be found: at the depth of 110 feet, the miners struck a sheet of copper some 20 feet in width and at different points several inches in thickness. The prosecution of this work is due to Mr. Hill of the Copper Falls' mine, who expressed the belief a year since, that there was a vein or a cross course between the conglomerate and greenstone. The result has justified his judgment. From the extremity of Point Keweenaw to the Portage Lake, and even to the Ontonagon, a distance of 100 miles, there are bands of thin strata of conglomerate between the beds of trap. The foot wall of the Waterbury vein, or cross course, is this conglomerate, which dips northerly under the greenstone. In this respect it resembles the National Mine on the Ontonagon. It has long been observed that the surface of this conglomerate, and even its mass and the rock above it, is well charged with copper. The prospect now is that this extended belt of conglomerate is to be, or may be, the guide to more rich veins of the parallel kind, on Point Keweenaw.

The location and the progress at some of the other mines is briefly stated by a correspondent to the *New York Tribune*:—

The Norwich is situated on the west branch of the Ontonagon river, about eighteen miles from the mouth, and twelve miles from Collins' landing. It is a well-defined vein, and has been traced and partially opened for more than half a mile in extent. The lode is well charged with copper from good stamp ore to masses of 4000 lbs. One shaft has been sunk to the depth of 245 feet on the vein; another 80 feet, and two others to an inconsiderable depth. The ten fathom level has been extended about 240 feet; the 20 fathom level, 220 feet; the upper part of the mine has been partially stoped out, producing about 800 tons of stamp and barrel work and 30 tons of masses. They are driving a working adit level 440 feet in length, which will give a back of 250 feet, and enable the company to work the mine to greater advantage.

The Windsor is situated about a half mile east of the Norwich. One shaft has been sunk 105 feet; two others about 80 feet each. Levels have been extended 290 feet.

The Ohio Trap Rock Company are working on the north side of the Norwich bluff. They have sunk one shaft 260 feet, one 200 feet, and several others 10, 20, and 30 fathoms. Levels have been extended for 200 and 300 feet; an adit level driven 150 feet, and cross-cuts north and south.

The Derby is about five miles west of the Norwich. They have been working two veins on the south side of the bluff. One shaft is down about thirty feet; an adit is being driven on the course of the vein, which will give a back of 225 feet.

The Hudson is a half mile west of the Norwich, and has sunk a shaft forty feet, on what appears to be the same vein that the Ohio Trap Rock are working on the other side of the bluff.

The Lake Superior Journal also adds respecting the mines on the Ontonagon:—

The *Toltec Consolidated* mine has three shafts, and is commencing a fourth; three of which are on the main vein, discovered last December.—The previous work has all been done on a feeder. This is one of the cases where no external signs of the main veins are visible, but only the branches which lead to it from the south. From the old shafts on the feeder, the vein has been cut in two places by cross-cuts. It is neither parallel nor perpendicular to the range, but oblique and crooked, or bent in its course to the northward, like a bow with its convexity lying southward. Its underlie is to the northward,

apparently about 65° with the horizon.

In level No. 2, between shafts No. 2 and 3, the vein is very heavy, and the mass and sheet copper exposed is very strong. The discovery of this vein has given new life to the adjacent mines; several of which had been hitherto operating on branches, epidote streaks and regular masses, without wall or a regular yield of copper. This discovery shows a well-defined vein, like the Minnesota, of a good average thickness and yield.

In all the work done on the Toltec, to May 1st, a shaft 365 feet—drifts 578—and cross-cuts about 100. For the want of summer roads, no shipment can be made this season.

The President of the Ohio Mining Company, the location of which abuts on the Toltec, on the south, has recently discovered a heavy, and, as far as exposed, a very regular vein on the company's tract.

It is apparently like the Toltec, oblique to the uplift, bearing a little more to the east, and dips northerly. It is situated at the foot of the south bluff, and is to be wrought immediately.

The *Adventure*, which adjoins the Ohio on the west, is opening what some regard as the same vein, at the westerly termination of the south bluff. Hitherto this company has been at work on irregular masses, nests, and patches of native copper, in the east end of the west bluff. The metal is distributed through the entire mass of the mountain, without reference to vein-stone, and has been found in masses weigh ng 500 and 600 pounds.

This is the most remarkable deposit of copper on Lake Superior. It seems to be entirely without system, or by any of the laws of mineral deposits. The quantity of copper is such, that if concentrated in veins or *stock works*, the yield would be very heavy. The company has shipped about sixty tons, much of it taken from solid trap-rock, without any difference in its composition, from the bulk of the mountain. It has been wholly in masses and barrel-work, as they have no stamps.

The adits, galleries, and shafts are worked at random through the ground, crooking and curving, opening and contracting, as the show of copper increased or diminished. The bluff is penetrated here, and on the Ohio location in scores of places, by works of the ancients, most of them situated on the epidote and chlorite nests that abound in the works. The ancient miners have wrought out numerous caves, grottoes, holes, pits, trenches and cavities of every shape.

They had not discovered the regular veins here, as they did at the Minnesota, but have taken out a large amount of copper.

The arrival and transhipment of copper at Saut St. Marie for the month of April is thus reported:—

Cliff Mine, 361 tons in barrel work, and 130 tons in masses; Minnesota, 120 tons in barrel work, and 55 tons in masses; National, 3¼ tons in barrel work, and 17 tons in masses; North American, 6¼ tons in masses; Toltec, 3¼ tons in barrel work, and 2 tons in masses; Ridge, 9¼ tons in barrel work; Douglas Houton, 4 tons in barrel work; Bohemian, 2½ tons in barrel work; New-York and Michigan, 1¼ tons in barrel work; also 90 tons Bloom Iron from Jackson County; North West, 43 tons in barrel work, and 13 tons in masses; Siskowit, 12 tons in barrel work; North American, 11 tons in barrel work, and 27 tons in masses; showing an aggregate of 821¼ tons of almost pure copper.

NORTH CAROLINA COPPER MINES.

The North Carolina Company's vein exhibits remarkable richness the deeper it is opened. The particulars of this mine will be found in the first number of this Magazine. Its results are wonderful.

The vein of the Vanderburg Mining Company is thus described by Prof. Emmons, State Geologist of North Carolina:—

In pursuance of my duties, connected with the theological survey of the

State of North Carolina, I have examined the mine known as the Vanderburg mine. This vein is a continuation of the vein of the well-known Phœnix mine, which has been well known for many years, and which, if it has not paid a profit to the owners, the result is due to the unskilfulness of those under whose charge it has been worked. The Vanderburg property has not yet been worked so deep as the Phœnix, but it presents a much better prospect for copper than that does. It is located upon the western margin of the State belt, and is not likely to be cut off or injured by granite. Its width is from fourteen to twenty inches, and in the upper part is mixed and made up of brown ore. Its greatest depth is eighty-four feet, and in the progress of descent the copper has increased very perceptibly. It dips to the west, and has a strike of N.·75 degs. W., and may be traced upon the surface half a mile. It is, therefore, what miners call a strong vein or mine. My notes do not show what amount of gold this mine has furnished by the common process of working. My opinion is that it is a very valuable mine, and one in which money may be safely invested; as the copper has increased materially, there is a high degree of probability of its proving valuable for its copper mines.

An analysis of a sample of the ore by Dr. Chilton of New-York yielded 29—27 per cent of copper.

The mine is distant from Charlotte, N. C., twenty-two miles, the terminus of the Charlotte and Columbia Railroad. The entire property of the company consists of 626 acres or one square mile of land—adjoining the property of the Phœnix Mining Company.

TENNESSEE COPPER MINES.

The copper mines of Polk county, Tennessee, are described by a correspondent of the Louisville Courier. We have extracted for the Mining Magazine one or two statements of interest:

The copper mines of Polk county are situated on the waters of Ocoee river, in a district of country known as Duck Town, near the corner of Georgia and North Carolina, within 35 miles of Cleveland, on the East Tennessee and Georgia Railroad: up to the present time there have been but two companies engaged in the work of the mines (known as the Hiwassee Copper-mining Company, and Ocoee Mining Company,) with a force of about sixty men each, at a cost of about $1,200 each per month. This force gives regular employment to 25 or 30 wagons in the transportation of the ore to the railroad.

The ore is the black sulphuret of copper, with traces of the yellow sulphuret coming in below, and found in regular and well-defined veins under a heavy bed of iron, at the depth of from 12 to 90 feet from the surface, and ranging from 8 to 22 feet in width, so far as the two properties have been tested. The ore taken out by the miners is found immediately under the iron, and the quality shipped to New-York varies in richness from 14 to 70 per cent., the average being from 25 to 30 per cent.

The ore, up to the present, has to be taken through Georgia from the mines to Dalton, the southern terminus of the East Tennessee and Georgia Railroad, a distance of 72 miles, and will have to go the same way for the next three months, by which time a fine road will be completed down the bank of the Ocoee river to Cleveland, a distance of 25 miles, which will make a saving of 40 miles wagon transportation and a saving of $7,50 per ton on the freight.

In addition to the two companies now operating, eight others have been lately formed, and purchased as many separate and distinct properties in the same neighborhood, upon which ore of the same description has been found and equally rich. They are now preparing to commence operations, and will be under way in the next four or five months, thus making ten distinct companies.

These mines are part of the country purchased from the Cherokee Indians under the treaty of 1835, and were bought from the State of Tennessee in 1842, a portion at 12½c., and another portion at *one cent* per acre, mostly at the last price.

VIRGINIA COPPER MINES.

The copper mine of the Manasses Company is located in Fauquier county, Virginia. From the report of Professor A. S. Piggot, of Baltimore, we have made such extracts as will serve to inform our readers of the nature and location of the vein:

The general direction of the mountain range is northeast and southwest, running parallel with the Shenandoah mountains, which divide the valley, and cut off from it the vale of the Shenandoah river, and with the great eastern range of this continent, the Alleghanies. Spurs of considerable height shoot out at various angles from the eastern side of this range, inclosing valleys and subsiding into the hills which rise from the tertiary formations. These mountains are a primitive formation, and consist chiefly of stratified rocks, which have been thrown up and displaced by volcanic force acting from below. The principal components are clay slate, which is most superficial; graywacke slate, gneiss, and occasionally some stratified sienite, chlorite, and talcose slates. These are all more or less tinged with epidote, chloride of iron. The strata are generally very regular, except where they have been dislocated by veins of minerals running through them. They have an inclination of about 45 degrees to the southeast. The slopes of the mountains are every where covered with loose fragments, which have come from the disintegrations of the rocks composing them. Some of the scattered stones are flat, and have come from the mass of the mountain; while others are large, irregular boulders, composed of the same materials, with the veins, hereafter to be described, and, like them, containing copper. It was, in fact, the discovery of the metal in one or two of these boulders which led to the explorations that have since been made.

The veins actually traced up to this time are three in number. The courses of two of these intersect one another, close to the boundary line between Mr. Hall's and Dr. Taliaferro's farms, at the summit of one of the mountains rising from the gap, about eight hundred feet above the level of the railroad. The ascent, however, is so gradual, that there is a good wagon-road passing close to the line. The first of these veins has been opened in several places, and traced for a considerable distance along the mountain. It is a true vein, with well-defined walls. It has been opened to the depth of only six feet on Mr. Hall's property, and of nineteen on Dr. Taliaferro's, and yet a large number of very rich specimens have been taken out. The other vein has not yet been opened upon Mr. Hall's farm; but from the regularity of its course, as shown by the openings made on Dr. Taliaferro's property, one of which is within a few feet of the boundary line, it is absolutely certain that it must continue through Mr. Hall's lands also, in the same direction. These veins form an acute angle with each other, and their direction is nearly that of the axis of the ridge. The third vein is lower down the mountain, near the gap. It runs very much in the same direction with the other two, cutting the strata, nearly in the course of the mountain range, northeast and southwest.

The veinstone in all these seems to be granite or sienite, altered by the action of fire. This constitutes the basis. They contain large quantities of epidote and chlorite, and are full of masses of quartz and scattered bits of feldspar. The lower vein contains also asbestos, fibrous talc, and titaniferous iron. Chlorite, epidote and quartz, are found in crystals here, and so, I am informed, though I have not seen them, are the various ores of copper. The importance of this fact, as an indication of the value of these mineral veins, I need not point out.

The copper is every where disseminated through the upper veins as black and red oxide, carbonate, silicate, and native copper. In the lower vein, which is on the level of the railroad, and cut by it, pyrites is the only ore, with the exception of an occasional speck of carbonate, that I could find. This vein has been followed for a mile or more along its outcrops. As pyrites usually lie deep, the probabilities are, that this vein will prove valuable when it is worked,

especially since the metal is every where so abundant in the surrounding mountains.

It is manifest, therefore, that there is copper in great quantity and of much value on this estate. The resemblance between these veins and those of the Ural, which have yielded from four to nine millions kilogrammes of eighteen per cent. ore a year, is very striking. The only question to be asked, is—Can they be worked to advantage? This is at once answered by a consideration of the character of the veinstone, the position of the land, and the facilities of transportation.

As for the first, I would say that I have been in the cuts made for exploration, and had no difficulty whatever in procuring specimens, though I had but a little hammer with me. I have understood, also, from those engaged in blasting it, that it is not very hard to drill. The situation of the land is admirable. The facilities for drainage are great, and there is excellent water power upon the farm. As for transportation, I have already said that the railroad runs directly through the property, which is only about seventy miles from Alexandria. An inclined plane could be constructed with very little difficulty, which could carry the ore from the mouth of the mine to the railroad.

PROFESSOR PIGGOTT'S ANALYSIS OF ORE.

No. I. is a piece of veinstone, in which the unaided eye can detect no copper. Its general hue is a greenish gray, with a sort of blush of pale reddish brown. This is shown by the lens to be produced by minute specks of native copper scattered through the mass. The poorest portion of it was selected for analysis, and the rich bits carefully broken off. Its powder was something between a sorrel and a fawn color. It yielded 2·7 per cent. of copper.

No. II. is a piece of veinstone containing ore. The prevailing color of the stone is green, from the infusion of epidote throughout the mass. The ore appears in the form of shots and streaks of black oxide, with occasionally a small fibre of native copper. The powder was a reddish brown. This yields 18¼ per cent. of copper.

No. III. is a piece which could hardly be distinguished from the last by the unaided eye. If any thing, it looked less promising than No. II. The powder was the same color. Its percentage of copper was 27·7.

No. IV. is a bit of pyrites from the veins on the railroad. It was knocked off from a large fragment of rock blown off the roof of the vein during railroad excavations. This contained a large quantity of feldspar in beautiful rhombs. When freed as completely as possible from veinstone, it yielded 14·1 per cent. of copper.

No. V. is another piece of pyrites, containing about as much rock as ordinary dressed ore. It gives 8·8 per cent.

No. VI. is a piece of quite pure ore, knocked off from one of the pieces taken from the vein opened at the summit of the hill. It is a mass of black and red oxide, inclosing native copper. It yields 89·1 per cent. of copper.

MARYLAND COPPER MINE.

The Dolly Hyde copper mine, of which we have a report of some length by Dr. Charles T. Jackson, is located in the town of Liberty, in Maryland. The description of the vien is thus made :—

"The present openings of the Dolly Hyde mine show that the copper ore is contained in a large vein of white, fine-grained dolomite, or magnesian limestone, which bears evident proofs of having been once in a fused condition. This limestone is filled with segregated masses, and string-veins of rich copper and silver lead ores. The limestone vein is about 110 feet wide, and is included between strata of blue, green, and violet-colored clay slate rocks. The ore, dressed coarsely for the furnace, has yielded about twenty-five per cent. of copper. It may be raised, by the use of proper machinery, to forty per cent. copper ore without much trouble.

THE COPPER TRADE OF GREAT BRITAIN.

The following details respecting the copper trade of Great Britain will be found to be of interest by all who are engaged in mining or smelting copper in this country:—

The annual average sales of copper ore in Cornwall and Swansea together, during the last seventeen years, have been 203,848 tons of 20 cwts. each, or 194,141 of 21 cwts. to the ton (by which it is sold), and the average annual value £1,419,285. The average yearly manufacture of copper in Swansea, &c., during the last seventeen years, has been 18,714 tons.—*Braithwaite Poole's Statistics of Commerce.*

In Great Britain there are 176 copper mines now working, and the ore therefrom is smelted at the furnaces and works, chiefly in Swansea, Amlwch, Bagillt, Liverpool, St. Helens, and Cheadle. In Cornwall, owing to the want of coal, the British ore is not smelted there, but mostly sent to Swansea, it being cheaper to carry the ore to the coal, than the coal to the ore—the lesser quantity to the greater. The countries from which foreign ore is chiefly imported into England are Cuba, Australia, and Chili, and the ports to which it is sent are Swansea, London, and Liverpool. The total weight of copper manufactured is not large, although the value is considerable; and it requires a large capital to carry on the business, which, in this kingdom, is entirely in the hands of about a dozen rich companies, and the trade is managed very respectably. A curious custom of selling ore has long existed. Meetings called "ticketings" are held periodically—generally every week on a Thursday in Cornwall, at Redruth, Truro, Camborne and Poole; commonly every fortnight on a Tuesday, at Swansea; also occasionally in London and Liverpool—when each individual is presented with a printed ticket, or account of the various lots of ore offered for sale, having blank columns ruled, wherein he inserts the price at which he is willing to become the purchaser of any lot, and the highest figure of course commands the purchase; but in the event of any two or more parties writing down the same figures for any particular lot, the ore is divided between them. The chairman of the meeting being the largest vendor, takes each list from the bidder, and draws a line under the highest sum offered, when he is said to "tick it;" thus may the derivation of the term "ticketing" be accounted for. Copper ore is always assayed before being purchased, each buyer and each seller having his own assayer; and the sales are effected from their reports; but, if any difference should arise, a third assayer is called in, whose decision is final. The principal importers of foreign copper ore into Liverpool are half a dozen leading merchants; and the British ore is chiefly consigned to the agents of the copper merchants, of whom there are about a dozen in Liverpool. The vessels generally discharge their cargoes at the Harrington dock, where there is an open yard or depot, and a stock of 500 to 1500 tons of ore; also a mill for crushing it, as the ore is now always crushed before being sampled or smelted. The yield of copper varies according to the quality of the ore from fifteen to seventy-five per cent., and the price fluctuates fifty per cent. An average yield of British ore may be taken at seven per cent., and that of foreign ore at seventeen per cent.

The quantities of copper ore of all sorts imported into Liverpool, foreign and coastwise (always in bulk), last year, are recorded as follows:—

From foreign parts,	6,035	tons.
" Swansea	2,014	"
" Ulverstone,	1,644	"
" Amlwch,	575	"
" Carnarvon,	595	"
" Other places,	914	"
Total,	11,777	tons.

The total quantity of British manufactured copper—in cakes, ingots, bolts, &c., and sheets packed in cases—imported into Liverpool last year, principally from Swansea, Llanelly, and Bagillt, was 7,078 tons, and the metal sheathing brought by railway and inland navigation amounted to nearly the same weight. The exports of manufactured copper are chiefly made from London, Liverpool, and Swansea, to the United States of America, to France, the Mediterranean, and East Indies, where the sheets are frequently used in lieu of slates for roofing. Our exports from Liverpool last year were as follows, only forty-two tons of which was foreign copper re-exported:—

To the United States, ...	3,550	tons.
To France, Mediterranean, &c., . . .	1,707	"
To the East Indies, ...	368	"
Total, ...	5,625	tons.

Formerly the East Indies was our best market, but latterly the trade thence has fallen off considerably.

The entire value of the copper trade of Liverpool last year, including metal sheathing, approached £1,500,000.

THE CONSOLIDATED AND UNITED MINES OF CORNWALL.

This is the title of some of the richest mines at present in Cornwall, England. They are located about two miles east of Redruth.

The elevation of the surface above the level of the sea is from 200 to 300 feet. But the depth of the bottom of the mines below the level is about 1370 feet.

The nature of the rock is primary clay slate, resting immediately on granite a short distance westward of the mines. The clay slate is intersected by numerous channels of porphyry, which have nearly the same direction as the mineral veins, and are often of considerable width. The porphyry appears also sometimes to form large irregular masses in the clay slate. Both rocks are traversed by veins of quartz and clay intersecting the metalliferous veins.

In the Consolidated Mines the eight following lodes are extensively worked:—Wheel Fortune lode, Casvea lode, Deeble's lode, Old lode, Taylor's lode, Tregonning's lode, Martin's lode, and Glover's lode. In the United Mines, the principal workings are upon the Old lode, and about five or six others are more or less productive. Numerous smaller lodes, or "branches," occur also in both mines. The principal lodes are from two or three to seven or eight feet wide; and the "branches" are generally twelve or eighteen inches wide. The direction of the lodes varies from nearly east and west to about twenty degrees north of east, and south of west. The underlie of the principal lodes is from two to three feet per fathom north, that of the smaller ones about the same south.

The ore is chiefly copper, occasionally native copper, blue and green carbonate of copper. Tin, or oxide of tin, also occurs, but not in very great abundance.

The produce of the ores averages 9½ per cent. of fine copper in 100 parts of ore.

The veinstone is cheifly quartz, of which many varieties occur. The accompanying mineral substances are generally "Gossun" (oxide of iron and quartz) in the back of the lodes, blende, iron, and arsenical pyrites in depth.

The depths of the principal shafts are respectively 248 fathoms and 275 fathoms, although some of the others are scarcely of less depth.

The average depth of the adit at the principal shafts is about 30 or 40 fathoms.

The quantity of water varies from 2000 to 3000 gallons per minute. The height to which the water is raised is about 230 fathoms at the Consolidated Mines, and about 110 fathoms at the United Mines.

The power employed in drainage consists of 9 steam engines; 3 of 90 inch cylinder; 3 of 85, 1 of 80, and 2 of 65. The water-wheel is 48 feet in diameter.

The average annual expense in drainage is about £12,700.

The quantity of ore annually produced was a few years since about 16,400 tons of copper, and a few tons of tin.

The produce in metal was 1,517 tons of fine copper, and a little tin. The total returns or value of which was £119,800.

The total cost of the mine including lord's dues, was £98,500, and the total clear profit to the proprietors per annum £21,000. The amount of capital invested in the mines is £75,000.

The interest on the capital invested has been 280 per cent. after paying back the original capital. The proportion of costs to returns exclusive of lord's dues, has been 78 per cent.

About 2,500 persons are employed at the mines, of whom 1,450 are employed under ground. Their wages averages 3 English shillings per day. The produce of the mines is sold to the smelting companies in Swansea, South Wales.

ANCIENT METALLURGY.

Dr. Verey, of the School of Mines in England, has made an examination of some of the specimens of metallic workmanship which have been discovered by the celebrated Layard, in his researches amid the Ruins of Ancient Nineveh. The collection has been deposited in the British Museum. It consists of numerous illustrations of ancient metallurgy, such as vessels, weapons, and miscellaneous articles, clearly proving that the Assyrians possessed considerable skill in the art of working metals. The examination was made in the Metallurgical Laboratory at the Museum of Practical Geology, and a summary of its results is contained in the subjoined statement:—

1. *A portion of a bronze bowl, or dish, from Nimroud.*—The surface generally had a green coating of carbonate of copper, which was crystalline where it was thickest. Below the thickest parts of this coating was a layer of red or sub-oxide of copper, also more or less distinctly crystalline. A portion of the metal free from crust was analyzed, and found to be composed of copper and tin in the following proportions:

	Composition.
Copper . . .	89·51
Tin . . .	10·63
	100·14.

2. *A bronze hook from the same ruins.*—The external appearances were similar to those of No. 1.

	Composition.
Copper . . .	89·85
Tin . . .	9·78
	99·63

3. This was a very remarkable specimen. It was a small casting, in the shape of the fore-leg of a bull. It formed the foot of a stand, consisting of a ring of iron, resting on three feet of bronze. It was deeply corroded in places, and posteriorly was fissured at the upper part. A section was made, which disclosed a central piece of iron, over which the bronze had been cast. At the upper part, where it had been broken off, the iron had rusted, and so produced the crack above mentioned. The casting was sound, and the contact perfect between the iron and surrounding bronze. It was evident on inspection that the bronze had been cast round the iron, and that the iron had not been let into the bronze: and in this opinion I am confirmed by Mr. Robinson of Pimlico, who has [illegible] a bronze casting.

	Composition.
Copper . . .	88·37
Tin . . .	11·33
	99·70

Some interesting considerations are suggested by this specimen.

The iron was employed either to economize the bronze, for the purpose of ornament, or because it was required in the construction. If the former, iron must have been much cheaper than bronze, and therefore, probably more abundant than has been generally supposed. No satisfactory conclusion can be arrived at on this point, from the fact that bronze antiquities are much more frequently found than those of iron; for the obvious reason, that bronze resists, much better than iron, destruction by oxidation. Although, I think, there are reasons for supposing that iron was more extensively used by the ancients than seems to be generally admitted; yet, in the specimens in question, it appears to me most probable, that the iron was used because it was required in the construction. And if this be so, the Assyrians teach a lesson to many of our modern architects and others, who certainly do not always employ metals *in accordance with their special properties.* The instrument under consideration, it will be borne in mind, was one of the feet of a stand composed of an iron ring resting upon vertical legs of bronze. A stand of this kind must have been designed to support weight, probably a large caldron; and it is plain that the ring portion should therefore be made of the metal having the greatest *tenacity*, and the legs of metal adapted to sustain *vertical or superincumbent weight.* Now this combination of iron and bronze exactly fulfils the conditions required. I do not say that a ring of bronze might not have been made sufficiently strong to answer the purpose of the ring of iron; but I do say that, in that part of the instrument, iron is more fitly employed than bronze. Moreover, the contrast of the two metals, iron and bronze, may also have been regarded as ornamental.

4. *A small bell, corroded like the preceding.*

	Composition.
Copper . . .	84·79
Tin . . .	14·10
	98·89

The proportion of tin was probably increased in this specimen, with reference to its use as a bell; though some of the ancient coins, rings, and other articles, have been found to have the same composition.

These analyses were made by one of the assistant-chemists, Mr. T. Philipps.

The first three specimens described have the composition of the bronze, which was most extensively employed by the ancients. Experience seems to have amply proved that this alloy is best adapted to the various purposes for which it was designed. It is extremely durable, although in some of Mr. Layard's specimens corrosion has proceeded to such an extent as to have left no trace of the alloy in a metallic state, both the copper and tin having been completely oxidized. One such specimen consists of a white central stratum, composed chiefly of stannic acid coated with suboxide of copper, which in its turn is coated with green carbonate. This alloy is excellent for casting, and for works of art, such as statues and bas-reliefs, may be especially recommended; works in the production of which no unwise considerations respecting the cost of the metal should be allowed. Moreover, the ancients have left us abundant evidence of their great skill in the working of this alloy. They were able to cast it extremely thin, which is no small difficulty; and with great labor fashioned it into articles for domestic use, into shields for war, and vessels for the service of their temples, which they skilfully elaborated by chasing and by curious ornamental tracery. They applied it, moreover, in their most sumptuous decorations, as the ornaments obtained by Mr. Layard, from the throne of the Assyrian monarch, will testify.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

THE ULSTER LEAD MINE.

THE Ulster Mining Company has become quite successful in its operations, yielding a handsome revenue to its proprietors. Its monthly expenses we learn are less than $2000. The following details respecting the operations at the mine are furnished officially to us in anticipation of the regular report. Professor JAMES T. HODGE is President of this company.

The Ulster mine is situated at Ellenville, at the western base of the Shawangunk mountain, about 30 miles west of Newburg, and 25 miles north of Middletown on the Erie railroad. Stages run every day from both these places to Ellenville. The Hudson and Delaware canal passes for more than 50 miles under the western slope of the Swawangunk. At Ellenville the canal is the western boundary of the property of the Ulster company. The village lies on the opposite side of the canal from the mine. The company own a fine farm of 24 acres lying between the canal and the mountain. It is on the eastern edge of this farm the vein of lead ore was opened. It passes into the mountain nearly vertically, and is traced in the other direction towards the canal—on the line of its bearing up the mountain towards the southeast, the company own for more than half a mile; and on one side (the S. W.) about the same distance; on the other (the N. E.) more than a mile. The mountain tract contains about 800 acres.

The western slope of the Shawangunk is a hard white sandstone, known as the "Shawangunk grit;" this rock lies in strata which slope with the face of the mountain, and pass at an angle of about 48 degrees beneath the next overlapping strata of the valley. These are limestones, known as the Niagara limestone, which is a continuation of the lead-bearing limestone of Wisconsin and Iowa. The vein in its course cuts both these formations. It has not yet been followed into the limestone—the soil and diluvium covering the rock in this portion of the valley at an unknown depth. Here, unlike the lead veins of the West, the ore is found abundantly in the *sandstone*, which underlies the limestone. It was discovered some two years since by a boy, who broke off a little galena from a vein which just showed itself in a seam in the sandstone. This seam followed in led immediately to a thick mass of galena without any mixture of veinstone. It has now been followed horizontally into the mountain 175 feet, and vertically 65 feet below the foot of the mountain. The vein has never been lost, and has continued to lead in a straight line. The courses of ore incline upon the vein with the strata of the mountain. They are followed up the back of the drift till they lead out to the surface; the inner courses present a great height for stoping. None of them have failed to produce clear galena, so far as they have been followed up or down. Their length varies as also their width; the latter is in more than one course of ore about 5 feet. The ore at the end of the present workings has been followed no less than 20 feet, with an average width of 4 feet. There is exposed in this drift not only an extraordinary amount of ore, but ore of an extraordinary degree of purity; most of it requires only breaking by hand to prepare it for the furnaces. Several hundred tons of pure galena have been thus made ready for smelting, without its having yet been considered necessary to order stamps or crushers.

The shaft sunk just outside the mountain follows the seam, which inclines about 80 degrees towards the N. E.

The layers of ore cut by the drift are found to cross the line of the shaft as they keep their course with the dip of the strata. At the depth of 27 feet a large "vug" or cave was discovered, which extended 56 feet under the drift, and in

one place was 16 feet wide. It was coated and nearly filled with yellow clay, which concealed the splendid crystals of galena, sulphuret of copper, and transparent quartz that covered its walls. One of the courses of galena in its roof presented a width of FIVE FEET, and so extended up into the drift. The depth of this cave has not yet been ascertained; nor have attempts been made to remove the rich ores of lead and copper in its lower portion. These will be come at in the regular course of mining, and be more advantageously extracted than they could be at present. The top of another cave has been cut within 25 feet of the end of the drift. It has not been cleaned out, but appears to be of similar character to the other. A stream of water runs into it, and must find its way to the shaft 150 feet off.—"Vugs" are esteemed a very favorable feature with all miners, especially when wet and containing this yellow clay, or what they call "*flucan*." To find them of such size is very unusual. The shaft has reached about 65 feet in depth. It is now intended to start a second drift below the cave, and finally remove the ore between the two drifts, and so continue this work by drift below drift onward in both directions, and downwards and upwards, so far as the seam and the courses may lead.

When the ore met with warranted the construction of furnaces, two Scotch-hearth hot blast furnaces were provided, capable of smelting over one hundred and twenty pigs (9000 lbs.) of lead every twenty-four hours. Two competent men are required to each one, each shift of eight hours, which is about as long as they can work. Two such men were obtained, and they were to instruct others. They commenced last month with a stock of galena to keep one furnace running six months, and enough more in sight in the mine to justify the expectation, that both might be kept going for years to come. The ore was found to work well. The steam engine and blowing cylinders proved much more than competent for the work required. *Forty* pigs of lead in two shifts were repeatedly obtained from one furnace; but the great heat of the weather in addition to that of the work, caused several of the smelters to give out. Three were ill at one time, so that the production of the furnace has fallen off until the number of smelters can be increased. The shipments to the end of last month have been 615 pigs. Their weight is about 7-10ths of the ore consumed. The fuel employed is only a few fagots of pine wood (which at Ellenville costs $1 50-100 per cord) occasionally thrown into the fire. The common estimate of consumption is less than a cord to the ton of lead. The engine requires less than a ton of anthracite, worth about three dollars per week.

The financial affairs cannot but be regarded as on an excellent footing, for it is confidently believed by the officers of the company, that the ore already out of the mine, together with what is brought to light, but not yet broken down within, amounts in value to the aggregate product of of all the stock if sold at present prices. Nor can any reason be given why confidence should not be entertained in the continued productiveness of the mine. If in the limestone, which seems to be the natural repository of galena, the vein should prove like the western veins in this rock, then the field for working is of unknown extent. If it should prove limited in production to the sandstone, it is several hundred feet through this rock, and its strata extend many times farther beneath the valley than the twelve or fifteen hundred feet they rise above it.

It may be that in greater depths the copper ores will increase in proportion to the galena. These, too, have been found remarkably pure and very little mixed with other ores. Few mines have afforded such gigantic crystals of pure pyritous copper, or cleaner lots than the principal parcel already sold. What little blende has been met with has also been very pure, hardly mixed with either galena or copper ore.

There is another mine upon the property of the company, which, as long ago as 1712, was known as the "Old Mine." A drift has been run into the mountain no less than 426 feet. In the preparations to sink a shaft upon the vein, pieces of pure galena, weighing nearly fifty pounds, have recently been found, also some yellow copper ore.

The company was organized under the general law in the month of February last, with a capital of five hundred thousand dollars, all paid in in cash (and a sworn certificate of the payment of the capital filed in the office of the clerk of Ulster county). The capital is divided into one hundred thousand shares at $5 each. The lands owned by the company were bought from James Elnathan Smith, Esq., the President of the Keystone Mining Company, for the sum of $450,000.

At the time of the purchase in the month of February last, the mines on the property had been sufficiently developed by the Keystone Company to induce the trustees of this company to think the price paid a fair and by no means an excessive one. The developments since made, and the ascertaining of the exceeding purity of the ore, the ease with which it is smelted, and the superior quality of the lead, all render it difficult to place a sufficiently high estimate of value on the company's property. Were the mines located in England, where such things are better understood, it is certain the price of the stock would represent millions. Besides the lands held in fee, the company have mining leases in some 4000 acres of land. But the present stockholders need have no apprehension that they or their successors, for many generations, will be called on to pay a percentage on ores taken from the leasehold estate, as the present indications warrant the belief that for very many years—perhaps centuries—there will be sufficient stoping ground on the veins in the mines on the estates held in fee. All the buildings, machinery, &c., required are finished and in excellent order, and paid for.

WESTERN LEAD MINES.

The Galena *Jeffersonian* of the 2d instant, furnishes a very encouraging statement of the increase of the lead trade during the present year. The statements, we have reason to know, are authentic. The high price of lead, and the experience of the uncertainty of gold mining, has stopped the rage for emigration to California, and comparatively few persons have left the mines this season. Others have gone to work in the mines, and the result has been an increase of 63,104 pigs, compared with the shipments of the same time last year. The following is the statement:

	Pigs.
Shipped from Galena per river	45,581
Do. do. per railroad	1,000
Do. Buena Vista and Cassville, Potosi, and Dubuque	17,052
Total for May	63,633
Shipped in May, 1852	54,656
Increase in May, 1853	8,977
Shipped in 1853, from 21st March to 1st June	173,208
Shipped in 1852, from 15th March to 1st June	109,104
Total increase to date for 1853	64,104

The Lower Mines in Missouri are employing all the hands that can be obtained, and with an increase of mineral. The high price of lead has induced many persons to engage in mining instead of continuing their ordinary pursuits, and by the end of the year the production will be materially increased.

MORRIS AND JOHNSON'S PATENT METAL DEPOSITING PROCESS.

Some very beautiful specimens of steel chains, coated with various metals under a new process, for which letters patent have recently been obtained by Messrs. Morris and Johnson of Birmingham, have been brought to our notice during the past week, and one remarkable for the uniformity of the precipita-

tion, in point of thickness and color, the successful management of the tinting, and the height of polish which has been communicated to the surfaces. The specimens sent us include examples of the deposition of silver and brass—the color of the latter having several different degrees of depth.

Messrs. Morris and Johnson's patent embraces the deposition of alloys of gold and silver, German silver, brass and zinc, all of which can be deposited with ease, certainty and dispatch, upon any metals whatever; and particularly upon iron. Adopting the means invented by the patentees, we understand that they can deposit metallic alloys on surfaces composed of malleable iron, wrought iron, cast iron (which is found to require great battery powers), steel, soft iron, tin, zinc, lead, copper, and all the inferior metals. This process also enables the thickness of the deposit to be adjusted to the greatest nicety according to the intention of the operator.

There are some points incidental to this patent, of a new and very important character. It is well known that hitherto silver has not been successfully deposited upon steel, without having recourse to an intermediate coating of copper. The advantage to the practical operator of being able to dispense with this intervenient step, which greatly enhances the cost of the process, and the tissue consumed in accomplishing it, will be readily appreciated. In several other metallic combinations the same observation will apply in a greater or less degree. Hitherto, in certain manufactures the difficulty experienced in depositing upon iron and steel has been the want of adhesion, but by this invention perfect adhesion is secured, together with any thickness of coating. The beauty of the brass deposit in the examples before us is indeed remarkable, and, aided by the fineness and high polish of the surface, presents a close resemblance to gold, of which, we presume, it is intended to be an imitation. The deposit upon them we are informed is extremely thin, but having been polished previous to immersion in the bath containing the deposit, they are taken out with a surface as brilliant as that which they possessed when they were immersed. The invention is highly spoken of, and is likely to become one of great practical value, and prove to be an advance in the application of electricity to manufacturing purposes.—*Mechanics' Magazine.*

MIDDLETOWN SILVER AND LEAD MINES.

This mine is located at Middletown, in Connecticut. It is one of the oldest in the country. The reports of the exploring geologists have just been issued. They are those of Dr. Percival, of New Haven, and J. D. Whitney, geologist. In the present number of the Mining Magazine we present our readers with many interesting historical incidents relating to the mine, accompanied with the report of Dr. Jackson; reserving for a future occasion more extended remarks respecting what has been done by the proprietors:—

The existence of quite an extensive, but abandoned mine, at Middletown, Ct., was made known to the public in 1852, by Dr. Franckfort; an account of this discovery, with certain documents calculated to throw light on the operations formerly carried on here, has been published by Dr. Barratt, in the Middletown "Sentinel and Witness." From these interesting papers we learn that the oldest inhabitants have no knowledge of these mines having been wrought within their recollection, since only a vague tradition of their existence remained. It is certain that they must have been closed before the American Revolution.— The early history of Connecticut shows that Gov. John Winthrop had obtained, as early as the year 1651, a license, giving him almost unlimited privileges for working any Mines of "Lead, Copper, or Tin, or any minerals; as Antimony, Vitriol, Black Lead, Alum, Salt, Salt Springs, or any other the like;" since he was allowed "to enjoy for ever said mines, with the lands, woods, timber, and water, within two or three miles of said mines." A special grant was made to Gov. Winthrop, in 1661, of any mines or minerals he might discover in the neighborhood of Middletown.

We do not learn that there is any positive evidence that Gov. Winthrop caused the mines to be worked, but his grandson, John Winthrop, F. R. S., was evidently well acquainted with the existence of deposits of lead, silver, and other metals, in the State of Connecticut, of which he made a large collection, and sent it to the Royal Society. This ancient collection of minerals was accompanied by a catalogue in which the localities of most of the specimens are given in detail. Dr. Barratt is of opinion, from the examination of this catalogue, that any mention of the Silver Mines of Middletown is purposely avoided in it, lest the locality where they were obtaining valuable returns should be made known to the world, and thus they should become liable to the payment of the royalty of one-fifth of the produce of all gold and silver ore, according to the terms of the Charter of the Connecticut Colony. And yet it is certain, that mining research was long continued in the region by the Winthrops, since we have on the point the evidence of President Styles's diary, in which he says, speaking of the Governor's Ring, a mountain in the northwest corner of East Haddam: "Gov. Trumbull has often told me that this was the place to which Gov. Winthrop, of New London, used to resort with his servant, and spend there weeks in roasting ores, and assaying metals, and casting gold rings." There were also numerous specimens from the White Rock's range, near Middletown; among others, in all probability, the Columbite, afterwards discovered by Hatchett, in the collection, and recognized as containing a new metal, called by him Columbium.

That this mine was worked by regularly educated miners, probably Cornish, is evident from the character of the excavations, which are scientifically laid out. They had penetrated downward about one hundred feet, and had made excavations amounting, in all, to fifteen hundred feet. A large quantity of the ore must have been shipped away. The mine was closed with care by timber, when it was suspended; and a ladder, and other wood-work left in the mine, were found in a good state of preservation, at the time the excavations were re-opened. Iron implements, on the contrary, were found to be much corroded.

It is to be hoped that farther researches among the archives of Middletown, or the papers of the Winthrop family, will throw more light on the interesting question of the time when these mines were worked.

Report of James G. Percival, State Geologist, Connecticut.—The Lead and Silver Mine, in Middletown, is situated in a dark-colored, hard, silicious schist, of limited extent, connected with a more extensive range of gray micaceous schist, in which last are included beds of coarse white granite. The silicious schist is the true ore-bearing rock, beyond the limits of which I should not look for ore. I regard it as a modification of the micaceous schist accompanying it, in which the scales of the mica are indistinguishable, and would term it an argilloid, micaceous-silicious schist, but not a proper argillite, to which the mining term *killas* is generally applied. The main body of the ore, and particularly of the steel-grained argentiferous ore, is apparently included in a continued vein, lying in the general direction of the stratification, but marked by distinct lateral walls, and possessing all the proper requisites of a good vein, in uniformity of direction, width, and richness in ore. Like all veins, I believe it is subject to occasional enlargements and contractions, but in no instance that I could observe, in tracing it through its whole extent, as far as exposed to any decided interruption. It appears to me, indeed, remarkably regular in its width and productiveness. At several points taken at hazard, which I examined more particularly, I found such uniformity in width, and in the proportion and quality of the ore, as to lead me to regard the vein as peculiarly reliable.

The principal matrix (vein-stone) is white quartz, with which is occasionally associated calcareous spar and sulphate of barytes, and more rarely fluor spar. The including dark-colored schist is also in some degree calcareous, and I may add, that this peculiar range of schist is accompanied with a bed of gray limestone, not observable, however, in the vicinity of the mine. This occurrence of lime in this formation I consider decidedly favorable, the geological connection

of lead with lime being well ascertained. Two distinct varieties of ore occur in the vein, generally arranged in distinct portions, in bunches or strings,—more often. I think, the latter. These are the large-grained cubical galena, or lead ore, so called, which contains, if any, a much less portion of silver, and the fine steel-grained ore, or silver ore, so called, which is truly an argentiferous galena, and contains an unusually large proportion of silver, as is shown by the analyses which have been made of it. Throughout the greater part of the principal vein, as exposed in the old levels, I observed that it contained a fair and encouraging proportion of this latter variety. It is on this circumstance, I conceive, that the value and importance of the mine depends. The analyses of this variety of the ore show that it can be worked with great advantage for silver. The general uniformity of width in the vein, which may average *two* feet, and the nearly uniform productiveness of the vein, so far as I could observe it, I consider as offering satisfactory encouragement that the mine could be worked profitably for a period of such duration as would cause very little risk of exhaustion. I see at present no indication of such hazard. The principal vein, which, as I have already stated, appears to follow the course of the stratification, is, like the latter, subject to some deviation from a straight course. The course of the stratification along the brook is more nearly north, to a point opposite the entrance to the old adit. It then bends more eastwardly toward the shaft, in which direction it probably continues to Connecticut River, beyond which the same range of rock, in a line further east than at the brook, is seen to bear again more northerly.

In the western bank, below the dam, and near the bend in the strata, are three or four excavations, in which, I conceive, portions of the principal vein have been reached, which may be observed on the surface of the rock, between some of the openings at least. In the most southern of these openings, a large body of ore has been recently excavated, with a due proportion of the silver ore, and with the unusual occurrence of native silver, connected, as stated to me, with calcareous spar. The occurrence in many parts of the vein of distinctly crystallized portions, resembling geodes, in which are observed fine crystals of the galena, and particularly of iron pyrites, as well as calcareous spar and quartz, and in which the native silver would seem to have occurred, may be regarded as a circumstance favorable to its character as a true vein. A little north of the openings in the north bank of the brook there is a decided change in the direction of the stratification, from north to east, as already stated, beyond which the rock does not appear along the brook, but bears more easterly through the fields, toward the Connecticut. The vein changes its direction in the same manner, and, crossing the brook to the old adit, continues, as I have already stated, with remarkable regularity, through the whole extent of the old mine.

Besides this principal vein, on which, for its extent, productiveness, and the character of its ore, the value of the mine appears to depend, several other veins may be observed, which cross the strata more or less obliquely, some of which, at the opening in the bank of the brook, appear as offshoots from the principal vein, or, perhaps, intersect it. These veins appeared to contain a relatively greater portion of the lead ore and a less of the silver ore, than the principal vein. They are all, besides, at least as far as I have observed them, small, and I should think of comparatively little moment. The Revolutionary vein, so called, at a remote distance south of the mine, is such an obliquely cross or transverse vein, and is of very small width, and contains but little ore. The schist is there more obviously micaceous, though approaching the peculiar schist of the mine, and is connected with an interposed bed of granite, which the vein traverses, as well as the schist.

I may here remark, that the specimens of ore taken from the old mine, since it has been re-opened, are generally unusually large and pure, particularly the great mass, abundant in strings of silver ore, at the office door, which would probably weigh from 1500 lbs. to a ton. The appearance of the vein in the

old mine generally indicates an unusual massiveness of the ore. Such are the facts of any importance which I have observed in connection with the mine.

In conclusion I would say, that although the vein might not be of sufficient importance, if it merely contained lead, considering the abundance of lead furnished by the mines of the West, yet, as yielding in a large proportion a peculiarly rich argentiferous galena, which may be truly called a silver ore, a vein of such size and uniformity, and so abundant in the proportion of the ore to the matrix, may be safely considered of great value. I would regard it as well worthy the attention of capitalists, and that if skilfully conducted in reference to its supply of silver, it would well repay investment.

James G. Percival.

January, 1853.

We add, by way of relief to the gravity of the subject, an entertaining sketch of a recent visit to this mine, by the editor of the "Middletown Sentinel," who was somewhat of a novice in the depths of the shaft:—

By the courtesy of Dr. Franckfort, the accomplished proprietor and superintendent of the Lead or Silver Mines just below this city, we were enabled to make a thorough exploration of the works now in successful and zealous operation at that place. We were in the first place shown a large collection of ore, the result of the blast mentioned in our last week's paper, amounting in all to some eight or ten tons, a large proportion of which is the real simon pure silver ore, with very little admixture of lead or copper.

There is so little quartz also accompanying it, that the doctor did not think it worth while to submit it to the process of stamping, but intended to barrel and ship it at once to the smelting furnace. We next visited the stamping department, and witnessed the operation of breaking up the ore by means of four immense steel shod stampers, each weighing 600 lbs. The water which sets these in motion, also washes the comminuted masses, and conveys the powder through sluices or troughs, whence it is collected and put in barrels. Having then encased our lower extremities in india rubber boots, and our caput in an old hat, while a thick woollen shirt covered our body, and protected our clothing from the wet, we proceeded in company with the doctor and another widely known *savan*, and the head miner besides, each armed with a lighted candle, to explore the bowels of the earth, whence the richest ore is obtained. Passing along a narrow passage cut through the solid rock, but little higher than our head, which passage serves to give exit to the water that trickles through, and also favors ventilation, we went cautiously along, picking our way among the loose fragments of rock left by the blast, stopping every now and then to observe and admire the sparkling of the silver that shone in the vein above our heads, and finally arrived at the old shaft which Dr. F. has recently discovered and reopened. Here we saw the old timbers and braces left by the miners, who over 100 years ago worked this mine, still as sound and undecayed as a week after they were put here. We looked down the deep dark chasm which yawned before us, and as the Cornish miner who led the way descended by an ancient ladder (also left in the mines), and disappeared in the gloom, the candle which he carried serving only to make darkness visible, we were forcibly reminded of our schoolboy days, when we read Virgil, about the descent of Æneas to the infernal regions, and we could not help quoting the well-known lines, begining "Facilis descensus Auernis," &c., &c. The doctor followed, and we went down a few steps, but hearing from those below that there was too much water to accomplish the whole descent, we were advised not to attempt it then, but defer it until another opportunity. This old shaft is quite interesting; it is constructed with considerable care, and shows that extensive operations must have been carried on here. At different distances, side galleries are cut in the rock, and down below the vein of silver shows out from 2½

to 3 feet in width. This old shaft was probably worked on account of the silver, and by persons well acquainted with mining. In fact, it is ascertained that at one time a party of Germans, at another, of Englishmen, under Col. James, worked it. On the approach of trouble between England and the colonies, it was abandoned and closed up, and during the war of the revolution worked only for the lead. It is more than probable, that the lead used for bullets at the battle of Saratoga was obtained from this mine, there being on record a letter from Gen. Ward, containing an order for 5000 lbs. of pig lead, and the answer stating that by a certain day the requisite amount should be at Newburg, on the North River. Middletown therefore did her part in whipping Gen. Burgoyne.

There is a tradition current among the farmers in the neighborhood of the mine, which runs to this effect. that years ago, an Englishman, after strolling around the mines and examining them, offered to work for the proprietors on condition that they would give him his board. and let him stir the kettle of lead while melting. It was observed that he began to prosper, bought land and set about building a house. He was watched, and it was noticed that he frequently thrust the iron rod with which he stirred the lead into the ground, and at night carefully collected the earth around the kettle, and melted it. He was therefore arrested and charged with theft, but nothing being proved against him, was allowed to go free. The above tradition, which involves a scientific fact, proves that the ore at this mine was long ago known to contain silver. It was reserved however for Dr. Franckfort to demonstrate its richness and develope its extent. The doctor has been diligently collecting facts connected with the early history and working of these mines, and when he has satisfied himself thoroughly with regard to them, will probably spread them before the public.

The Lake Superior *Journal* of the 2d says:—

The Superintendent of the Lake Superior Silver Mining Company, Geo. K. Smith, Esq., came down this morning from Michipicoten Island, where this new mine, now attracting a good deal of attention, is being opened, and mining work commenced. Mr. S. brings down six barrels of beautiful specimens of ore, or rather the native silver itself. The company have but recently put on a force of men to work this mine, which has been known to fame for several years as a very promising "surface show." The property at last has fallen into good men's hands, and the result of a month's working with fifteen men shows a handsome, well-defined vein of silver, native and in the ore, in connection with the copper.

The specimen before us shows both metals, and silver largely predominating; and as it is the same we received from this mine three years ago, when it was first discovered, we have no doubt as to its being a genuine and rich vein of silver.

The mine is situated about one hundred and twenty miles above this place, on the Canadian side of Lake Superior, and is owned by English and American capitalists, and we expect now to have silver mines as rich as those of Mexico opened on the north shore of the lake. Silver has been found in many places on the north shore.

About two months ago the annexed analysis was made by Dr. Chilton:—

Lake Superior Silver Mining Company—Analysis of Silver Ore.

I have analyzed a sample of "tailings" for Mr. A. Jay Smith, and find it to yield 1¼ grains of silver to the ounce. James R. Chilton, M. D., Chemist.
New-York, May 12, 1853.

I have analyzed the amalgam left with me by Mr. A. Jay Smith, and find it to yield seventeen dwts. of pure silver. James R. Chilton, M. D., Chemist.
New-York, May 9, 1853.

The above is from 5 lbs. ore from Lake Superior Silver Company Mine, equal to $476 per ton 2,000 lbs. A. Jay Smith.

1¼ grains to ounce is 20 grains to pound, is 1,666⅔ dwts. to ton, or 83⅓ ounces—$116 55.

COALS AND COLLIERIES.

EXHIBITION OF COALS AT THE WORLD'S FAIR IN LONDON.

The specimens of coals exhibited at the London Fair were chiefly from the English, Scotch, and Irish collieries. Some interesting particulars respecting the character of these specimens, with a notice of the early operations in working coal mines in England, are derived from the last report of the Patent Office.

Pit coal, which is now raised in England to the annual amount of more than 35,000,000 tons, and the applications of which are daily becoming more extended, was but little known in England as an article of commerce prior to the commencement of the thirteenth century. In the year 1238 the first researches for this mineral were commenced on the high ground in the neighborhood of Newcastle-upon-Tyne. These were followed in the year 1330 at the coal-field at Colliery, near Lancaster; in 1343, at Merrington and Ferry Hill; and in 1500, the several collieries at Gateshead, Wickham and Tynemouth were first opened. At this period the principal demand was for the use of blacksmiths and lime-burners, who appear to have been in the habit of employing this fuel long before it came into any thing like general use for household purposes. The mechanical resources of the miner were of a very limited nature, and the principal part of the coal extracted was consequently raised from such situations as afforded considerable facilities for the removal of the water which naturally drains into all subterranean excavations. In the earliest periods of coal mining this was drawn off through the level or gallery, by which the fuel itself was carried to the surface; but as the demand for the latter became more extensive, the mines were gradually worked at greater depths. This was effected either by extracting the water by an endless chain carrying a series of properly arranged buckets, or by a system of pumps worked by a water-wheel. The aid of horses was also frequently called in; but these were only employed in situations where water power could not be obtained; and they were subsequently superseded by wind-mills, which either raised the water by an endless chain, passing over pulleys, or by pumps worked by a due arrangement of cranks. The discovery of the steam engine has, however, produced by far the most important revolution in this branch of industry; for, by means of this machine, the working of the mines is not only in a most remarkable degree facilitated, but from the immense demand thus created for fossil fuel, the extraction of coal has become a most important branch of national industry in all those countries which have the good fortune to possess large deposits of this invaluable production.

England and Belgium are, in proportion to their extent, the richest with regard to the coal-fields they contain. In the former country, the coal deposits are estimated at 1-20 of the total superficies of the kingdom, while in Belgium they are supposed to occupy about 1-24 of the entire surface of the country. In France all the known deposits scarcely occupy 1-200 part of the soil; and all other European slates are much poorer still in this respect. Sweden, Norway, Russia, Italy, and Greece are almost entirely without these formations; Bohemia is in this particular the richest part of Germany, although its annual productions are far from being considerable. Spain, Portugal, Austria, and Poland have likewise their beds of coal; and the mineral is also more or less abundant in India, China, Madagascar, Van Dieman's Land, Borneo, and other East India Islands, New Holland, and at Conception Bay, in Chili.

In Great Britain there are several extensive coal districts, among the most important of which may be named those of Newcastle, Lancashire, Derbyshire, and Scotland. The veins are worked by means of shafts and galleries, in the same way that the metallic minerals are extracted from the lodes in which they are found; but as the seams of coal are generally much more extensive than

the metallic deposits, and as much larger masses are removed from the interior of the mines, the greatest care is required not only to prevent the crushing together of the workings, but also to introduce a current of air into every part of the colliery, so as to supply the workmen with fresh air for the purpose of respiration, and to prevent the accumulation of the explosive gases which frequently issue from the beds of coal. The very numerous varieties of coal have given rise to distinctions, founded partly on its age and appearance, and partly on its quality. In all kinds the structure of the wood from which they are supposed to have been formed is obliterated, although partial impressions of plants, indicating their origin, frequently occur. The coals form a more or less compact mass of dark brown or black color, sometimes dull, but more frequently possessing a vitreous lustre, which often exhibits a decided iridescence. Their specific gravity is considerably above that of wood, and their structure decidedly granular. They are always distinctly stratified, and have generally a cleavage at right angles to the plane of deposition. The different laminæ of which they are made up are usually in close contact with each other, but are sometimes separated by thin layers of other minerals—such as iron pyrites, carbonate and sulphate of lime, galena, sulphate barytes, the soda salts, and still more frequently by a double carbonate of lime and iron. The fracture of the shining kinds of coal is conchoidal; that of the duller varieties is hackly. Common coal, and particularly that from the newer formations, is frequently observed to be made up of layers of different appearance—the one kind, which is black and shining, with a conchoidal fracture, is rich in carbon; whilst the duller varieties are of a brown color.

The composition of the ashes of coal is in a great measure determined by the nature of the rock in the vicinity of the seam from which it is extracted; for, besides containing the inorganic elements originally forming parts of the plants, by the decomposition of which the coal has been produced, they will also, to a certain degree, consist of earthy particles, deposited in the pores of the coal by the infiltration of water from the over-lying strata. The chemical composition of coals varies according to their different geological ages, and the localities from which they are obtained; but although they differ considerably in the different amount of their relative constituents, the nature of their ultimate elements is invariably found to be the same. All kinds of coal are essentially composed of carbon, hydrogen, and oxygen; but besides yielding a certain portion of silicious and earthy residue and of sulphur, they usually afford traces of nitrogen, arising from the multidude of organic bodies, of which they contain the remains.

Among the specimens of coal exhibited, there was anthracite from Tenby, South Wales; from the county of Tipperary, Ireland; and from the western side of the Vale of Neath, near Swansea. This substance is the oldest of all kinds of fossil fuel, and is chiefly found in the transition formation; its structure is perfectly homogeneous; its fracture conchoidal, and its color of a jet black, with a vitreous lustre, which frequently shows a powerful play of colors. This coal contains an extremely large proportion of carbon, with but a small amount of volatile constituents, and is consequently totally unfit for the manufacture of gas, although well adapted for many purposes requiring intensity of heat and durability in the furnace. From the composition of this fossil being more nearly allied to that of coke than to that of ordinary coal, it is frequently employed in lieu of the former, and is extensively used in iron furnaces, where the hot blast has been adopted.

The percentage composition of two of the above-mentioned specimens, as stated by Sir. H. T. De la Beche, and Dr. Lyon Playfair, in their first report on coals suited to the steam navy, is as follows:—Anthracite from the Vale of Neath: carbon, 91·69; hydrogen, 0·79; and ash 1·50. Anthracite from Tipperary, Ireland: carbon, 80·18; hydrogen, 2·21; oxygen, traces nitrogen, 0·23; sulphur, 6·76, and ash, 10·71. The specific gravity of the former specimen was found to be 1·357, and that of the latter 1·590.

Among the specimens from the Welsh coal-fields will be observed the Powell's Duffryn, the Aberdare Company's Methyr, Nixon's, Methyr and Risca black vein, together with coal from the Llangenneck Company, whose mines are situated a short distance from the port of Lanelly. The coals from the above districts are usually characterized by an irregular brilliant fracture, and many portions will be observed to possess a peculiar radiated appearance, seldom noticed in coals coming from other parts of the country. When used under a steam boiler, they are found to light easily, and to blow off steam readily, with the production of but little smoke or soot. This variety of coal, which has also a very high evaporating value, is well adapted for the generation of steam, and is largely employed for this purpose in the navy, where its smokeless properties are evidently most useful.

The specific gravity of this class of coals usually varies from 1·29 to 1·35. In order to afford a general idea of the chemical constitution of coals from this part of South Wales, we will select as an example, from the report already quoted, the analysis of the Birch Grove Graigoa, which, although one of the best varieties belonging to this class, very fairly represents the average percentage of good Welsh coals. The results obtained by the analysis of a fair sample of this product are as follows:—Carbon, 90·94; hydrogen, 4·28; oxygen, 0·94; nitrogen, 1·25; sulphur, 1·18; and ash 1·41.

From the Lancashire districts there were coal, cannel coal, and coke, the produce of the different seams worked by the Moss Hall Coal Company, at Ince, near Wigan. The coals from this part of England are of good quality, but are harder, and possess a more cubical fracture than those from the South Wales coal-fields; they likewise contain a larger proportion of ash, and give off considerable quantities of smoke when first lighted. The percentage of hydrogen is moreover greater in these coals than in the Welsh varieties, and they are therefore used more frequently in the manufacture of gas. Cannel coal is a smooth, almost vitreous substance, with a conchoidal fracture, and brown, black color, and is chiefly employed for gas making, for which its composition eminently adapts it. The cannel coal raised from the above mines is of good quality, and produces an extremely pure and highly illuminating gas. The composition of an average sample of cannel coal is as follows:—Carbon, 80·21; hydrogen, 6·30; oxygen, sulphur and nitrogen, 8·54; and ash, 4·95.

One ton of coal having the above composition will, on being carefully heated in proper retorts, yield 11,000 cubic feet of gas, capable of affording during its combustion an amount of light equal to that obtained from 1,150 best spermaceti candles. Coal of this description would be still more largely employed in our gas houses, if the coke obtained from it were of good quality; but this is of such a crumbling nature, and possesses such little durability, as to be of no value except for the burning of lime or similar purposes. The coals from the Derbyshire are distinguished by a peculiar hackly structure, and a tendency to split into long, prismatic fragments. They likewise contain a rather large percentage of ash, and frequently iron pyrites and white shale. Among the specimens exhibited from this district are samples from the Butterly Iron Works, near Alfreton, which very fairly represent the fossil fuel of the neighborhood, and of which the composition is, according to the official report, as follows;—Butterly Company's Portland coal—carbon, 80·41; hydrogen, 4·65; nitrogen, 1·59; oxygen, 11·26; sulphur, 0·36; and ash, 1·28. This coal has a specific gravity of 1·301; and affords 60·90 per cent. of friable coke.

The coals of Yorkshire have in general a more schistose appearance than those of the last-mentioned county, but they are nearly similar in point of composition and evaporative value. From the Staffordshire district some immense pieces were sent to the Exhibition. This variety affords, from the nature of its structure, great facilities for removal in large masses, as was seen from the Denbigh Hall Colliery, near Tipton, and was found at the western entrance of the building.

In this department of the Exhibition were also found coals from the Scotch coal-fields, and particularly from those in the neighborhood of Edinburgh. Among these were samples from the Dalkeith Colliery, worked on the Mid-Lothian coal seams. This coal is of the variety called "splint," and burns with a long flame and much smoke. It is also good for the purpose of gas-making, as may be inferred from the following analysis:—Dalkeith coronation seam—carbon, 76·94; hydrogen, 5·20; nitrogen trace of sulphur, 0·32; oxygen, 14·37; ash, 3·10.

ANTHRACITE COAL TRADE FOR 1852.

The following is the *official* quantity of anthracite coal sent to market from the different regions in 1852, together with the increase and decrease:—

Schuylkill.	1852.	*Increase.*	*Decrease.*
Railroad, . . .	1,650,912	642	
Canal, . . .	800,038	220,881	
	2,452,950	221,523	
Pinegrove, . .	66,543	66,543	
	2,519,492	288,066	
Lehigh Region, . .	1,114,026	124,730	
Del. and Hud. Co. .	496,843	19,665	
Pennsylvania Coal Co., .	426,426	108,509	
Wilkesbarre, . .	320,000		16,000
Shamokin, . . .	25,846	947	
	4,902,634	541,917	16,000
Wisconsin Semi-Bituminous,	59,857	5,258	
Dauphin Co. do., . .	33,639	13,639	
Total supply in 1852,	4,996,130	560,814	
		16,000	
Total increase in 1852, . .		544,814 tons.	

LEHIGH COAL TRADE FOR 1852.

The supply of coal sent to market by the Lehigh Region was derived from the following sources:—

	Tons.	*Cwt.*
Lehigh Coal and Navigation Co., ...	429,786	06
Room Run Mines, ...	80,481	05
Beaver Meadow, ...	46,280	06
Spring Mountain Coal, ...	139,627	02
Colerain Coal, ...	37,781	07
East Sugar Loaf Co., ...	12,566	03
Cranberry Coal Co., ...	48,920	03
Hazleton Coal Co., ...	130,627	11
Diamond Coal Co., ...	41,763	08
Buck Mountain Coal, ...	104,202	02
Wilkesbarre Coal Co., ...	41,989	19
Total, ...	1,114,025	12

Of the whole supply of coal sent to market in 1852, Schuylkill County, Pennsylvania, furnished more than one-half, as follows:—

Schuylkill County, ...	2,519,493
All other Regions, ...	2,476,637
Total tons, ...	4,996,130

Of the whole quantity sent to market from the commencement of the trade:—

Schuylkill County furnished, ...	20,447,234
All other Regions, ...	17,413,631
Total tons, ...	37,860,865

COAL TRADE OF CLEVELAND, OHIO.

The trade in coal has risen to great importance in Cleveland. The following interesting table exhibits the constant increase for the past twelve years, and the enormous increase in the last year:—

COAL ARRIVED FROM 1840 TO 1853 INCLUSIVE.

	Bushels.		*Bushels.*		*Bushels.*
1840, . .	167,045	1845, . .	889,880	1850, . .	2,347,844
1841, . .	479,441	1846, . .	893,806	1851, . .	2,992,343
1842, . .	466,844	1847, . .	1,238,622	1852, . .	3,940,749
1843, . .	387,844	1848, . .	1,925,451		
1844, . .	560,842	1849, . .	1,910,474		

To this may be added the amount which arrived in the time intervening between November 14 and December 14, viz.: 357,114 bushels.

ANTHRACITE COAL TRADE FOR 1853.

The amount of coal shipped from Richmond, Pa., in all directions, to the close of the week ending June 25th, was . .	489,781	tons.
To same time last year, ...	589,429	"
Decrease, ...	99,648	tons.
The amount of coal sent over the Pottsville, Reading, and Philadelphia Railroad from the Anthracite Region, to the close of the week ending July 14th, was	790,714	14
The amount shipped by the Schuylkill Canal since the opening of navigation to July 14th, was	362,964	19
Total the season by railway and canal, . .	1,153,679	13
To same period last year, . , . . .	1,222,923	15
Decrease as per this year, ...	69,243	08

The following are the results of the Lehigh coal trade, for the present year, up to the 9th July:—

Summit Mines.	170,613	01
Room Run Mines, ...	31,911	07
Beaver Meadow Co., ...	19,809	12
East Sugar Loaf, ...	10,096	10
Spring Mountain Coal, ...	51,814	19
Colerain Coal, ...	21,846	15
Hazleton Coal Co., ... ,	46,534	17
Cranberry, ...	18,298	04
Sugar Loaf, . . . , . . .	16,313	06
Buck Mountain Coal Co., ...	30,683	04
Wilkesbarre Coal Co., ...	10,417	04
	428,338	19
Last year, ...	438,081	19
Decrease this year, ...	9,743	00

In the results of the week ending July 14th, the *Miners' Journal*, located in the heart of this coal region, remarks:—The shipments this week are large, showing an increase by railroad of about 10,000 tons, and also about 6000 tons by canal, but they fall short a few tons of the quantity sent for the cor-

responding period last year. On the Lehigh, the shipments for the week show a similar result.

The demand for coal is beyond the ability of our operators to furnish, under existing circumstances—it is impossible to get the men to work regularly, and many of the beasts in the mines are standing idle a considerable portion of the time.

THE FIRST STEAM ENGINE IN A MINE.

Steam, that powerful auxiliary to the labors of men, has been used under almost every variety of circumstance. And now, for the first time on this continent, it has been taken down the shaft and set up in the depth of a mine.

This, among other interesting facts relating to a colliery in Schuylkill county, Pa., is derived from the following statement:

Were it not for the steam engine, we should not be capable of extracting more than one-fifth the coal from our mines which is now done. The engines employed at the mines in this county, at the close of the last year, were equal to 6,509 horses' power, many of which run day and night, so that the steam power employed may be stated at equal to not less than 10,000 horses. Prior to 1765, the steam engine was of but little use for mining purposes; the celebrated Watt turned his attention to it about that time, and brought out many improvements, both in its construction and application. Engines have been in use in the deep mines in the north of England for many years; and they have first been introduced under ground here at the Lewis colliery, belonging to George Miller, Esq.

The colliery is situated about 1½ miles northwest from Pottsville, on the Lewis vein, and may be said to be one of the best red ash operations in the region. The coal above water level having been worked out some years ago, a perpendicular shaft was sunk, cutting the vein at the depth of 255 feet from the surface, at which a fifty-horse power engine was erected for the purpose of hoisting coal and pumping water up the shaft, A twelve-inch set of pumps was put down the shaft, which proves amply sufficient for pumping. The arrangements for hoisting are by constructing a cage or carriage somewhat longer and wider than the wagon containing the coal. Three chains are suspended down the shaft, and secured top and bottom; and eye-holes are made on the sides of the cage, through which those chains pass, the cage being free to slide up or down the chains, which serve as guides to prevent it from swinging against the sides on its way up or down the shaft. The wagon, with its contents, is run on the cage, and the whole hoisted up by a strong chain attached to the drum of the engine. It is common in shafts to have one cage going up while the other is coming down; but here it has not yet been necessary to put in more than one cage, with which it has been found that they can hoist 150 wagons a day, when the engine has to pump water at the same time; but when the pumps are not working, 250 wagons per day can be hoisted with one cage. The coal, to the level of which the shaft was sunk, was also worked out, and it becomes necessary to go deeper. The shaft, however, could not easily be made available for this purpose, as for every ten feet in perpendicular depth sunk, the horizontal distance to the vein would increase nine feet, the vein having a south pitch of 26 degrees. A slope was therefore sunk down the pitch of the vein, commencing at about seventy feet along the west gangway from the foot of the shaft. The slope was sunk ninety-five yards. The hoisting on which was done by extending a chain from the drum of the engine down the shaft along the gangway and down the slope. A wagon was then hoisted up the slope while the cage was going down the shaft, and *vice versa*. The coal, down to the level of the slope, was worked out last year, excepting a pillar of thirty-four yards immediately below the upper gangway, left to prevent the top water from going to the workings below. It was then necessary to continue the slope still deeper, which could not be done without first erecting an

engine at the head of the slope. A sixty-horses' power engine was completed some four weeks ago, which appears to do its work well, and which, we presume, is the first engine erected underground on the American continent. The expense in blasting away rock, to make room for an engine and its connections of such large proportions, was itself a heavy item; and taking the machinery, boilers, &c., below, and fitting them together, 250 below the surface, was no small undertaking. Since the completion of the engine, the slope has been sunk to the depth of seventy yards below the last working, and the vein at that depth presents a face of splendid coal seven feet thick. With a vein of such thickness, and of the known good quality of the Lewis vein, the operators will, we hope, be remunerated for the large amount of capital expended to make it available. The ventilation of this colliery is most complete, although much troubled with gas some time ago; yet when the air-ways were made larger, and a suitable furnace constructed, they had no further difficulty. The main airway is not less than six feet square in any one place, and the result is, they can have any quantity of air through the workings they wish for. Since the erection of the engine underground, the furnace has been dispensed with, the fires of the engine boilers answering the same purpose. The investments at this colliery amount to $46,000.

CUMBERLAND BITUMINOUS COAL TRADE.

For the week ending June 16, 1858:

	R. Railroad.	Canal.	Total.
Mt. Savage R. R., to	4,300	1,378	5,678
Cumberland R. R., to	3,843	1,323	5,166
Lonaconing R. R.	1,348		1,348
Total for the week,	9,491	2,701	12,192
Total for the year,			217,361 tons.

COKE AS FUEL FOR LOCOMOTIVES.

Some important experiments have been made to test the practicability of using coke as a fuel for locomotives, by the Baltimore and Ohio Rail Road, which are regarded as quite favorable in their results:

These experiments have been made on the main stem of the road, both east and west of Cumberland, and on the Washington Branch, and have resulted so successfully as to render it certain that the Company will as soon as possible adopt coke on all their passenger trains.

The difficulty heretofore has been to find a quality of coal which could be converted into coke adapted to the purpose of generating steam. Added to this was the necessity of familiarizing the engineers with the proper mode of using the new kind of fuel.

It now appears that coke made from Cumberland coal answers every purpose that could be desired. Already has it been used to carry passenger trains over the heavy grades of the Alleghany mountains, at a speed of 17 miles an hour, and with a pressure of 95 pounds per square inch. And on the Washington branch its success has been still more striking. There, we understand, a speed has been attained of nearly 45 miles per hour, with a pressure of over 130 pounds to the square inch, thus rendering it necessary to permit a constant escape of steam. The engineers too are beginning to appreciate the superiority of coke over wood. They find that one tender load of coke will take a train from Baltimore to Cumberland, while it is necessary to load three times with wood in going the same distance. Thus their labor is diminished, while at the same time they find it easier to handle the coke than the wood.

The saving in the use of coke is a most important consideration. As far as the experiments have gone, they indicate that the saving will not be less than *one-third*, and, in the course of time, will probably amount to *one-half*. Thus

when the Baltimore and Ohio Railroad Company shall abandon the use of wood entirely, as will probably be the case in a short time, the working of their road, so far as fuel is concerned, will be cheaper than that of any other in the country.

And here the question arises: if the saving in the use of coke in this region, where wood is comparatively abundant and cheap, is one-third, what will it be in the east where wood can only be had at high prices? The answer is plain. The adoption of coke as a fuel for locomotives in this region will be immediately followed by its introduction on all the eastern railroads. The managers of those roads will not only find it to their advantage as a cheaper fuel, but they will also find that where it is used there will be no sparks, smoke or cinders.

A new business will in this way be opened to our Cumberland coal region, and one which will every year increase in magnitude and importance.

IOWA COAL.

A great abundance of bituminous coal is said to exist for several miles up and down the Iowa river on both branches of it. It is near the correction line running directly west from Dubuque, and there is a still greater quantity on the Boon river directly beyond, in a due west course. The country is mostly prairie, and very level. The mines are not yet worked sufficiently to yield surplus.

The coals are found in bluffs about one hundred feet high. The first stratum is sandstone, the second slate, and the third coal, about ten feet above the level of the river, but they have not been worked sufficiently to ascertain their depths.

NORTHERN OREGON.

It is supposed that a vein of coal extends throughout the entire territory north of the Columbia river. Discoveries have been made at divers places adjacent to navigation on the Sound; and a specimen forwarded to the Secretary of the Navy, from the Steilaquamish river, by a gentleman of this territory, and thoroughly analyzed by Mr. W. R. Johnson, a practical geologist, has been pronounced by that gentleman the purest American coal he had ever examined —nearly free from sulphur, and its burning attended with a brilliant and beautiful flame. We have but recently mentioned the fact of important discoveries having been made on the Skookum Chuck, Chickeeles rivers, and also on Vancouver's Island, and that a company deeply interested in the use of coal, and of almost unlimited means and facilities, were completing arrangements for the trial of a sufficient quantity to test its utility for purposes of steam, and if found practicable, to enter at once upon the use of the means which will ultimately supply a full demand for the wants of the Pacific coast. The Skookum Chuck coal fields, from which the trial will be made, are situated but a few miles from the head of Puget Sound; and as soon as the weather will permit to justify the necessary excavation advantageously, an adequate supply for a thorough test will at once be transmitted to San Francisco.

On the supposition that its adaptation for the manufacture of steam may be successfully and favorably demonstrated, and the supposed extent prove equal to present public anticipation, what an immense storehouse of wealth, what a vast field for labor and enterprise, will this one important article of commerce up in northern Oregon!

We are informed by one who has the means of obtaining the most reliable information on the subject, that the amount of coal at present consumed on the Pacific coast, cannot fall short of thirteen thousand tons per month, or a hundred and fifty-six thousand tons per annum. This amount would soon be augmented by the demand of an increase in the number of ocean steamers, by the demand which would soon be made manifest from various islands in the Pacific, from the Californias, Mexico, and the South American States; it would soon employ a very respectable fleet of sailing vessels, thousands of laborers in the mines and on shipboard, and millions of dollars for an active cash capital.

IRON AND ZINC.

IRON REGION OF LAKE SUPERIOR.

This valuable section has heretofore attracted but little attention. Its importance is, however, beginning to be estimated. Some particulars respecting it we have gathered from the *Lake Superior Journal:*

The heavy iron work required in the construction of the Saut ship canal, will, of course, be wrought from the Carp river iron, and its superior qualities for such purposes will be fully tested and fairly shown. The care with which this iron is worked, its unequalled tenacity, its purity from every injurious foreign substance, are qualities established already by scientific and by practical experiment. The strength of the best Essex Co., N. Y., iron is 58812 lbs. per square inch; English Cable bolt is 59105 lbs.; Russia, 76069 lbs.; Carp river iron 89582 lbs. per square inch; this is the result of careful scientific experiment, which has been fully sustained by practical application of the article to various kinds of manufacture requiring great strength of material. It has been drawn in card teeth wire, wrought into gun barrels, nails, bars, bolts, and the heaviest iron work of our lake steamers, and under every circumstance it has been found unequalled for this valuable quality.

The ore from which this iron is made is inexhaustible, and can be got at comparative small expense. The Jackson Iron Company, and other proprietors of the iron hills of Carp river, can well afford to furnish, to a limitless extent, this ore corded up at their iron quarries ready to be shipped at fifty cents a ton of seventy-five per cent. ore, and this they will undoubtedly do, on the completion of the ship canal, and the Iron Mountain railroad, now in progress. What more can iron founders, and all capitalists interested in the manufacture of iron, ask?

The Marquette works have employed the winter laying in a stock of ore, and will soon commence making blooms. The Jackson forge has made some iron, say 150 tons. They have experienced some difficulty both from the want and excess of water as a driving power. They expect to produce iron rapidly the coming summer. The cost of quarrying ore at the mountain, is 50 cents per ton. Cartage to the Lake at Marquette, $3.00. It is said the Marquette Company has contracted to deliver 1000 tons of blooms during the summer at Cleveland, at $68 per ton. The cost of cutting wood is 5 shillings, or 63 cents, per cord. The yield of iron in blooms varies from $1.75 to $2.25 of ore to one of blooms. Cost of charcoal, 6 cents. The consumption of coal per ton is stated variously from 200 to 300 bushels. The reason of this we can easily see, as both the quality of the ore and of the coal varies very much, and also the skill of the workmen. We are not able to give the price of labor in the forges, but suppose it to be not far from $12 per ton. With these elements of calculation—remembering that the ore is to be washed and stamped—every one can make an estimate on the cost of producing iron here, and will see that it leaves a very handsome profit at $68 per ton in bloom.

NORTH CAROLINA IRON.

North Carolina, like Pennsylvania, abounds in valuable mineral treasures. Respecting the iron ores of the State, Professor Emmons, the State Geologist, has published some valuable particulars:

Iron, which is one of the most important mineral productions, is at the same time one of the most abundant in this State. It is not only abundant, but it is also of the finest and best kinds for bar iron.

Let us look at this subject one moment. Upon Deep river, in connection with the coal formation, there are numerous beds of the mixed oxides and carbonate of iron. Adjacent to the coal formation, and within a few miles of it,

the primary rocks also abound in the richest iron ore. In the most favorable position then, there is every inducement which can be offered in the interior of the country, for the establishment of iron works. There is no manufacture, there is no branch of business which brings so much prosperity to a community as the manufacture of iron. It at once opens a home market for all kinds of farm products—grains, fruits and meat. A large population which are not producers of food in any of its forms, have to be fed and clothed. Leaving out of view, however, A MARKET, I wish to call the attention of the public to the fact, that North Carolina is one of the best fields for the manufacture of refined iron. Pennsylvania may be much better provided with the means of making common iron; but refined bar iron can be made cheaper here than in the State I have named; for the sole reason that while this State has the right kind of ore for the purpose, she can produce the only kind of fuel in sufficient abundance to meet the wants of the business. This is charcoal: and she has it, because her forests are unfailing, and will renew themselves in about one half the period required in Pennsylvania and New York. No other fuel but charcoal can be employed for the manufacture of the best bar iron. From the best bar iron, steel is made, as well as all kinds of wire, and the various utensils which require a tough iron. Here, then, is a field not yet occupied in this country, and if we consider for one moment the present wants of a community for the best kinds of iron, as *steam boiler plates, and all the iron work of steamboats and railroad cars*, we can scarcely calculate the demand which might spring up for it. In addition to all this, why should not North Carolina manufacture the rails for her iron roads which she is constructing? It is true, it is too late to meet the demand for iron for her Central Road, but there is still room and time to begin for that business, for the extensions of this road East and West. This State should have made every foot of rail for her roads, for it must be certain, and, indeed, can be proved, that even at the low price of railroad iron during a portion of the twelve months past, it could have been made here at a small profit. The climate is more favorable than at the North, the means of living cheap, and fuel and coal abundant. The great expense attending the manufacture of iron, arises in a great measure from the cost of coal. Coal in North Carolina must be cheaper, by one-fourth, than in New-York. The ores are abundant, and favorably located. Among the ores of iron, the steel ore is quite abundant. At Mr. D. W. Johnson's, in Randolph county, the steel ore exists in two quite important veins. In Germany this variety is manufactured at once into steel.

My object in the foregoing remarks is to call the attention of capitalists to the manufacture of iron in all its branches, which I wish the public to consider in relation to the improvements in roads now in progress of construction.

But the iron manufacture is only one branch of industry which is destined to spring up and flourish. Copper is another metal which is now found to be abundant, and its mining and manufacture opens another road to wealth and encouragement in improvements in roads. It is, however, impossible that the three great pursuits of human life, AGRICULTURE, MINING, and MANUFACTURES, should prosper without also increasing, to a very great extent, the travel both for business and pleasure, and hence those who propose investing capital in rail and plank roads, cannot be disappointed, provided they are constructed through those sections which contain mineral wealth combined with a rich productive soil; and it is a remarkable fact in North Carolina, that fertile soils cover her mines of coal, copper, iron, and gold; whereas, in other rich mining districts the soil is usually unproductive.

ON THE APPLICATION OF THE BLAST TO SMELTING FURNACES.

It is a serious question as to whether the increase of quantity in the yield of blast furnaces, resulting from the introduction of hot blast, has not been more than compensated for by the deterioration of the quality. This has not yet been answered to the satisfaction of large consumers of iron. If a certain ratio between the quantity and quality of iron, produced from a determined

mass of ore, really exists, and if, in proportion as the yield is reduced, the quality is increased, the point at once assumes a plain commercial aspect. In that case, the manufacturer's object would be, to work his furnace so that the yield and quality should be such as should take best in the market; and he would naturally be disposed to go to the utmost verge in obtaining quantity, so that the quality be still good enough to preserve his position as a seller. I am, however, of opinion that there is not necessarily any connection between quality and quantity; and my present object is to point out the causes of deterioration, and to suggest an application of blast, by which both quantity and quality may be obtained.

It will readily be understood, that, in the cold-blast furnaces, the part immediately opposite the tuyeres is not the seat of the most intense heat; for the admitted air must absorb a portion of the furnace heat, and thus lower the temperature in that neighborhood. This weakens the oxidizing power of the atmosphere, through which the liquid metal falls to the hearth, where it is protected by a covering of cinder; and while acquiring the heat necessary for its action upon the furnace contents, it becomes somewhat diffused, and acts with purifying effect upon the materials in the upper part.

Not so with the hot blast. The heat of the entering air must increase the rapidity of its action upon the combustible materials in the furnace. Its intense effect, which may account for the superior yield, is confined to one part, for the oxygen thus supplied is speedily consumed, and the heat is insufficiently diffused throughout the furnace. The impurities contained in the coke and ore are not driven off; hence portions of the foreign matters are incorporated with the iron made on the hot-blast principle.

By heating the air, also, its oxidizing power is increased, and hence the metal is somewhat oxygenized in passing into the hearth, and its quality is therefore injured.

The general inferiority of hot, in comparison with cold-blast iron, then, seems to be, the concentration of the smelting process in one part of the furnace, and the intense oxidizing power of the atmosphere through which the liquid metal passes on its way to the hearth. The remedy which I propose is, the admission of a graduated blast at different altitudes—three separate points, for example, instead of directing the air all to one place, as at present.

The prospective results of my plan are, the oxygen would be more generally diffused through the furnace, the temperature of the upper part of which would be increased; the excess of oxygen which could be supplied in this way would unite with the impurities—as sulphur, for instance, contained in the coke and ore, and carry them off in the gaseous form. From the superior temperature of the upper part of the furnace, the flux and ore would become more thoroughly mixed in descending through the furnace; the ore would be gradually fluxed, so that the blast need not be so intense below the point of the greatest heat, and thus its oxidizing influence would be, in a great measure, avoided. Finally, it is probable that a fan blast might be substituted for the existing cumbrous blowing machinery.*

ALBANY IRON WORKS.

It is a part of the plan of the *Mining Magazine* to embrace in its pages not only the information relating to mines and mining operations, and the processes for the manufacture of metals, but also descriptions of establishments at which the work is done, that the advantages which any particular one shall possess may become known to all. For this reason we are gratified with the opportunity to insert the following account of the Albany Iron Works, owned by Erastus Corning and J. F. Winslow, furnished by a correspondent to the *New-York Tribune.*

* The Practical Mechanics' Journal.

"The rolling mill is probably one of the most complete in the world, and certainly has no equal in this country. The proprietors rank very high as men of practical business talent, but it is not too much to say that the arrangements of this establishment are due principally to the practiced judgment of Mr. Winslow. In June, 1852, the steam rolling mill was burned to the ground, involving an immense loss, not merely in the building and machinery, but in the inability to answer orders and fill contracts for iron. But the entire past experience of Mr. Winslow, assisted by his observations on iron establishments in Great Britain, was brought to bear on a plan for the new mill, which should combine every improvement within his reach, and, as if by magic, the present monster building sprang up. The public had hardly ceased to express their regrets that such a fine mill, as the former one, had been burnt, before it was announced that the most beautiful iron manufactory in America already occupied the site of the one destroyed. As to the dimensions of the main building, it is three hundred and sixty-five feet by one hundred and thirty-five. It has two wings; the one is fifty by seventy-five feet, and the other twenty-two by thirty-six feet. It covers an area of one acre and a quarter of ground, and to all intents and purposes is fire-proof. It stands in splendid contrast with iron works, as we usually see them. Here we have one roof covering an acre of ground, and the whole giving sign that the projector knew his own wants so well as not to be obliged to put up a shed here, and another there, to provide for something not originally thought of. The original plan was so perfect that the building itself is architecturally beautiful and unique. The walls are built of brick and the doors of iron, of which there are sixty-four double pair. To a stranger there is nothing more noticeable than the framework which supports the roof. This frame rests on cast iron pillars, and is itself composed entirely of wrought and cast iron. At first glance it looks airy, and insufficient for the heavy weight of such an immense roof, but the more accurately you examine the work in detail, the more clearly do you perceive that it is braced and supported in every possible point, and on the nicest mechanical principles. What the inventor—Mr. Dudley Blanchard—propounded in theory, is here wrought out into a splendid fact, since that airy framework has supported that roof without yielding a particle. There cannot now be seen a single place to indicate any settling or giving away. In the roof are found the only boards in the building. The tin roof is laid on boards ploughed and grooved together. When in full operation, two hundred men find employment in this mill alone. The motive power is steam, and this is generated in boilers heated by the escaping heat of the furnaces. The contrivances for this are exceedingly simple and economical, and with no expense for fuel in addition to what is consumed in the heating and puddling furnaces, five steam engines are driven. The operations of rolling, squeezing, hammering, blowing, &c., &c.. are all forced on by this simple piece of economical contrivance. When in full blast this mill must present a very striking appearance. Last night I was looking at it all lighted up with the heated iron just drawn from the heating furnaces to be rolled. I here saw the first engine of a locomotive character applied to fixed machinery, and its operation is beautiful. 'The crank shaft revolves 150 to 180 times in a minute, and turns the nine-inch mill without any intermediate gearing or other connections, approximating the conditions of a locomotive at high velocities; its full ordinary speed being equivalent to that of an express locomotive with seven feet driving wheels, travelling forty-five miles an hour.' This idea Mr. W. brought from Scotland and its practical success is unquestionable. Among the different processes of iron manufactures in this establishment, none gave me such real pleasure as the making of railroad axles. The care and expense bestowed to secure strong and sound axles are much to be commended in these days of rapid travel. The iron designed for this use, passes through no less than five different processes of purification, all of which are calculated to increase the toughness of the article. The work is finished under the hammer, and after it has sustained the closest inspection it receives the stamp of the manufacturers, who thus manfully shoulder the responsibility of all that goes out of their hands. In this

manner the lives of passengers, wheeled along like the wind, are cared for, and without doubt also to the pecuniary advantage of Railroad Corporations who use such axles. The manufacture of the wrought-iron chairs, in which place the rails excited gratification, also, because it looked safer than our brittle pot-metal chairs, which are still in such extensive use."

BAR IRON MANUFACTURE.

The application of what is called Hilton's patent process for the manufacture of wrought-iron directly from the ore, with wood or mineral coal, at a single heat, has been undertaken in earnest by Messrs. Davis & Co., of Cincinnati. We insert the following particulars respecting their process, in the pages of the *Mining Magazine*:—

They have put up a furnace, forge, and rolling mill in one room. The furnace and puddling oven are connected, when the ore is melted it flows into the oven, and by tapping a few inches above the oven hearth, the slug or drop flows out. The iron is balled and put under the trip hammer, made into blooms and prepared for the rollers; all done but with a small quantity of fuel. Owing to low water in the Ohio, Messrs. Davis & Co. have so far used a very inferior quality of black sandstone ore, yielding only about 15 per cent. of iron, and usually refused by foundry men as unprofitable.

The ore is pulverized and mixed with 20 per cent. of carbon—common bituminous coal—and then put into air chambers prepared for it, which are also heated by stone coal. In the puddling oven it is also heated by stone coal to a white or welding heat, and made ready for bailing. No charcoal or anthracite, heretofore considered as essential, is used. Nine blooms, of 70 lbs. each, averaging one in 15 minutes, required but three bushels of stone coal to the bloom. They are now turning out about 2½ tons of the best quality of blooms every 24 hours, at a cost of $12.50 per ton in Cincinnati.

The iron manufactured by the new process has been subjected to the severest test, such as making into horse-shoe nails, nuts, &c., and proves to be of as good quality as the best of blooms brought to the Cincinnati market.

The greatest advantages claimed in this process are the cheapness with which the iron is made, the cost estimated is but $22 to $23, where the ore and coal is near at hand—the use exclusively of the common bituminous coal—the uniform good quality of the iron—and compared with a blast furnace, costing, say, $30,000, which usually produces nine tons pig iron, worth, say $30 per ton, the daily products would be $270.

PRODUCTS OF SWEDISH MINES.

The entire yield of the Swedish iron mines, in 1849, was 1,185,300 metric quintals of cast iron, and 868,805 forged iron. The metric-quintal may be reduced to tons by multiplying by 1.971. The exports were as follows:—

	Metric-quintals.
Great Britain and Ireland,	241,680
North America,	178,776
Denmark,	65,685
Portugal, Madeira, Azores, &c.,	44,530
France,	41,397
Different countries not enumerated,	175,942
	748,010

PIG IRON.

The make in Wales, during the twelve months of 1852, amounted to about 700,000; Scotland, 600,000; South Staffordshire and Worcestershire, 600,000. These, with the make in Shropshire and other places, in the aggregate will produce between 2,000,000 and 3,000,000 pigs during the last year, and as such

quantities cannot be worked off by the mills and forges, the result is that the price of pigs must be put down, unless some of the furnaces be put out of blast.—*Mechanics' Magazine.*

NEW JERSEY ZINC COMPANY.

The new Board of Managers consist of C. E. Detmold, Horatio Allen, Hon. James S. Green, Hon. W. S. Wright, Gen. Cook and Edwin Port, of New Jersey; and Colonel James L. Curtis, William C. Squire, Hon. Silas M. Stillwell, and Mr. Pillot, of New-York. By the report of the Treasurer and Accountant, the Company's operations from 1st November last to 31st of May, have yielded a net profit of $48,289 26, and the production has been increased from an average weekly value of $4,700 to $10,300. The following table shows the increase:—

GROSS PRODUCTION.

November, 1852, . .	$21,217 58	Two weeks in Feb., .	$17,908 51
December, 1853, . .	19,880 24	March, ...	52,325 09
January, 1853, . . .	16,730 70	April, ...	36,456 04
Two weeks Feb., 1853.	12,754 86	May, ...	47,656 29
	$70,583 38		$154,545 99

An increase in favor of the last three and a half months of one hundred and eighteen per cent.

We have sought for some facts to account for this increase of production and the reduction in the cost of the article, a few of which we have obtained, to wit:—Twenty old furnaces consumed one ton of coal per day each, and by an alteration, at the trifling cost of one dollar each, a saving was made of one-third in the consumption of fuel, and at the same time increased the white oxide in quantity and improved its quality. In four new furnaces the improvement by experiment was carried too far, and thereby made what was reported to be black oxide. At this point another alteration was made, at a cost of one to three dollars for each furnace. A superior quality of white oxide was then produced, also an increased quality, and the coal consumed was less than half a ton per day. Twelve new furnaces have since been completed on the improved plan of the four referred to, and they will yield daily an aggregate of 10,000 pounds No. 1 white oxide. They have been made to yield 12,600 per day, with only 900 lbs of coal each for the twenty-four hours, and nearly all No. 1 quality; but they will average a production of 10,000 lbs. per day throughout the year. There will be hereafter 36 furnaces at full work on the improved system. The company have twelve more furnaces now in process of erection on the improved plan, which can be completed and ready to go into full operation on the 1st day of August next, making a total of forty-eight furnaces.

The company have produced during the last six months, up to May 31, 1,900,000 lbs., or 950 tons, and expect this year, embracing twelve months from 1st June, to produce 8,000,000 lbs., or 4000 tons. They have declared a dividend of four per cent. on their capital stock from the earnings between Nov. and June. Their products at this time are insufficient to meet the constantly increasing demand.

ZINC AND MANGANESE MINES OF ARKANSAS.

There are two ores of zinc which are of very frequent occurrence in the lead mines of the United States, viz.: the sulphuret, or blende, usually called by the miners "black jack," and the carbonate, called also "dry bone." They frequently occur in large quantities, particularly the "black jack," nearly or quite equal to the lead itself. And yet, until very recently, no use whatever has been made of them. They have been thrown aside along with the common rubbish of the mine, as utterly useless, while our country has been importing its whole consumption of zinc. The zinc ores of other countries are of no better quality, nor greater quantity, than our own; and yet we throw ours away, and send to other countries for all the zinc we want.

Why is this? Merely because the ores of zinc are more difficult to reduce than those of most other metals, and we have not had the skill and patience necessary to bring them into the metallic state.

But a change is about to take place; science has rendered the production of refractory ores more simple and easy than it formerly was; and blende, which was formerly considered almost incapable of reduction, has been compelled to give up its sulphur, and to yield its metal as a compensation to the enterprise of the smelter.

There is an unusual quantity of zinc ore in Arkansas, some of which is connected, as usual, with the lead mines, mostly in the form of blende; while large quantities occur by itself, of the kind called "dry bones" or the carbon ate. This latter kind is much more easily reduced than the other.

Hitherto the demand for zinc in our country has not been very great, or the quantity used has been rather limited; hence the market has been easily supplied. But the new uses to which it is now being applied, and the great increase in the quantities consumed for purposes to which it has long been applied, will cause a large increase in the demand for this article, and will add much to the motives for attempting to supply our own markets by the reduction of our own ores.

The discovery of the magnetic telegraph, and other uses to which electro-magnetism is now applied, will cause a considerable increase in the demand for this metal.

Another discovery has recently been made, which will probably cause a still greater increase in the consumption of zinc; and that is, that its oxide is an excellent pigment, considerably superior to white lead, which it seems destined strongly to rival, if not to supersede altogether.

Another and still later discovery has also been made, which seems likely to create a brisk demand for blende or the sulphuret of zinc; which is, that the ore, in its natural state, without smelting, or any other preparation than mere grinding, when mixed with oil, makes a valuable paint.

In view of these things, there is reason to believe that our zinc mines, which have hitherto been considered as utterly worthless, will hereafter be considered as offering inducements for the employment of capital and labor, equal to those of lead or any other metal.

Manganese is a metal which, both in its metallic state and in that of its ore, strongly resembles iron. It is harder, heavier, and more brittle than iron, and oxidizes more readily. It is not used in the metallic state at all for any use to which it is capable of being applied; so far as is known iron is better.

It is used altogether in the arts, in the state of ore, and in a variety of ways; for instance, in the manufacture of certain kinds of glass, of chloride of lime, and in the chemical laboratory. Its value chiefly depends upon the great quantity of oxygen it contains, and upon the facility with which it yields it up.

It is nearly always associated with iron, and is found in small quantities in almost every country in which iron ore is abundant. But it is usually so mixed with it as to be without any value. It is rather rare to find it by itself in such quantities as to admit of being worked.

In Arkansas there is a very large quantity of it, nearly or quite free from iron, probably enough to supply the world for ages to come. It is being mined by a company from Nashville, which has raised not less than two hundred and fifty to three hundred tons.

Small quantities of manganese have been mined in the State of Vermont, and likewise in New-York, but I believe the business has been abandoned in both, on account of the poverty of the lands. There is a bed of it in Virginia, which is said to be of good quality, and of large quantity; where mining is going at the present time, which is the only one now known in the United States, worthy of attention, except that in Arkansas.

B. Laurence, Geologist.

[*Hunt's Merchants' Magazine.*]

QUARRIES.

MARBLE FOR PITTSBURGH.

Our fellow-citizen, Capt. Mark Sterling, showed us a specimen of the marble recently discovered in Somerset county, on the line of the Connellsville road. It is a specimen of *genuine* marble, and there is now no doubt that there exists a large and almost inexhaustible quarry of that material in that region. It is of a reddish color, beautifully variegated, bears a high polish, and very much resembles the Egyptian marble. The color of the stone renders it well suited for building purposes in such a city as ours, where white or light-colored stones so soon become tarnished. We are thus within reach of a building material invaluable for ornamental purposes, as fronts for dwellings, stores, public edifices, &c.

This marble quarry is situated on the Youghoigheny river, 3½ miles above the Ohio Pyle falls, extends for a mile along the river, and the vein is from 22 to 32 feet thick, It covers a tract of 950 acres, and is easily accessible. The Connellsville railroad passes in front of it, and cars may be loaded right at the quarry. It will readily be seen how valuable to Pittsburgh this discovery is. The quarry is so situated, that slabs of almost any size may be quarried with ease; and the fact of its being so accessible by railroad, and the additional fact that it contains no less than nine different varieties of marble, in which the red preponderates, makes this discovery one of the most important of the day to this city.

The same neighborhood in which the quarry exists, contains also veins of other fine building stone, a splendid deposit of sand for glass-manufacturing purposes, coal without limit, and very rich layers of iron ore.—*Pittsburgh Gazette.*

MARBLE IN WISCONSIN.

The finest marble exists in Wisconsin. All that is needed is that the quarries should be properly worked, to be made available. The following is an extract from the report of Messrs. Foster & Whitney, published by order of the United States Government:—

"The limestone described as occurring near Drap river and on the Michigamig and Menominee, afford beautiful marbles. The prevailing color is light pink, traversed by veins or seams of deep red. Others are blue and dove-colored, beautifully veined. They are susceptible of a fine polish, and blocks of any kind may be procured. For tables, jambs, and vases, they would rival in beauty the most celebrated foreign products. Employed for external ornaments, the carved lines would withstand the vicissitudes of our variable climate, and remain sharp for centuries. These rocks in places exhibit singular surfaces, which, after all, is the best test of their durability. Fragments of pure white saccharoidal marble for statuary have been found upon the surface, but the beds from which they were derived have not been discovered.

The region where these are to be found is on the northern boundary of the State, adjoining Michigan. The Menominee river is navigable for a considerable distance from its mouth, emptying itself into Green Bay, thus affording a water communication.

GARDINER'S STEAM DRILL.

We have witnessed, at the granite quarries in Quincy, the operation of a new machine for drilling out rocks. Allow us briefly to describe the engine whose powerful blows excavated, in our presence, a huge hole horizontally in the granite. Figure to yourselves a platform about three and a half feet wide, and ten or twelve feet long, made of very strong timbers firmly bolted together. On the hinder end of this frame or platform stands a small upright steam boiler,

and engine (fastened to the boiler), of three or four-horse power. From the forward end of the platform rise four posts, strongly braced, and six or seven feet high. The posts serve to support a strong iron frame, bearing the drill and its apparatus, and allow it to be moved up or down, and to be placed in any position from the horizontal to the vertical. It can drill a hole above or beneath the machine, or in any intermediate direction. The drill is held in an iron mandrel, which is placed in the iron frame, which last is supported on trunnions moving in iron boxes between the aforesaid upright posts. Through these trunnions runs a shaft, on which are placed two cams inside, and a band wheel outside the posts. This band wheel is connected by a belt with the fly wheel of the steam engine. The cams serve to draw back the drill from the rock, and at the same time compress an India rubber spring of about five inches in diameter and fourteen inches in length. The reaction of this spring gives a gigantic force to the blow when the cams have released the mandrel. The length of stroke is about six inches.

This mandrel is connected to a crosshead which slides in guides, and this crosshead, by means of a stout screw, to another crosshead, against which the cams press in drawing back the drill and compressing the spring—which spring reacts against this latter crosshead, giving impetus to the drill. By a very simple but ingenious combination of a twisting bar, a pawl and a ratchet wheel, the drill is made to turn on its axis, about one-tenth of a revolution, more or less, each time the drill is drawn back. Thus it is at every blow compelled to strike in a new place, each time taking out large chips, clearing itself readily, and not making a wedge-hole. The strokes were rapid, sometimes 100 to 125 per minute, and might be easily increased to 150, or perhaps with longer practice, even 200 per minute. By another simple arrangement, the combination of twisting bar, pawl and ratchet wheel, causes the aforesaid stout screw to rotate slowly, and thus the drill is advanced towards the rock with a rapidity varying according to the softness of the stone; in limestone it might advance perhaps five or six, or even many more inches per minute. The drills in granite will ordinarily be changed about every six inches; but fourteen inches have been drilled without change.

In the common way of drilling, three men can sink a four-inch hole only about forty inches per day of ten hours, or four inches per hour. While this machine was in operation we saw the drill enter the rock horizontally in a four-inch hole at a rate of ten inches in eleven minutes, with two men only, and this, be it remembered, was not limestone or any of the softer rocks, but the hardest kind of Quincy granite. We can understand this better when remembering that two blows are given every second, each blow with the power of *twenty* men. Some of the advantages of this machine over others are—1st. The machine is relieved from the violent shock caused by the reactive force of the blow, unavoidable in machines hitherto constructed. 2d. The drill is kept uniformly rotating and advancing, and cannot turn backwards, nor recede from the rock, being prevented by the ratchet wheels. 3. The whole machine tends to advance towards the rock in consequence of the re-active force of the spring. Other machines tend to "advance backward." 4th. A number of drills may be operated in the same machine, and at the same time, and in different directions—thus rendering it very useful for tunnelling.

To contrast the expenses of hand and machine drilling, suppose twelve gangs of three men each, at $1.25 per day,—amounting to $45 dollars,—can sink 12 holes of 40 inches each, amounting in all to 480 inches, or 40 feet. Let us see how much it would cost to do the same by the steam drill, say two men at $1.50 per day each, plus, say $1.25 per day for coal, and 75 cents per day for interest on the cost of the machine and repairs, amounting in all to $5 per diem. This is *one ninth the cost of hand-labor*, no allowance being made for contingencies.—*Boston Transcript.*

MISCELLANIES.

FOSSIL ANIMAL REMAINS IN THE WEST.

A correspondent of the *Statesman*, in Ohio, lately related some very interesting facts respecting the geological formations of the West, and particularly its fossil remains, of which vast sepulchres exist. Some portions of his communication we deem of sufficient importance to afford interest to our readers:—

About a year since, while on a visit to St. Louis, I had an opportunity to examine a collection of extraordinary fossil animal remains from the Bad Lands, among which I recognized some belonging to an extinct species of the Rhinoceros, and others unknown to me, but resembling those, I thought, described Cuvier, as occurring in the gypsum quarries of Montmatre, in France.

This conjecture proves to be true, for in a "Report" by D. D. Owen, there is a description of the discovery of some most singular and extraordinary animal forms of the ancient world.

Nowhere in the world are geological phenomena exhibited in a more interesting manner, or upon a grander scale, than in our own country. Formations spread over thousands of square miles, and from the primitive rocks up to the diluvial, furnish the geologist with ample materials and opportunities for studying and enlarging the bounds of this most interesting science. The geological surveys made under authority from the national government, have contributed largely to the increase of our knowledge, and established many new and important facts. Not the least interesting among those brought to light and proved by this report, is the fact, that this country, instead of being the *new* world is certainly *older* than a large portion of Europe.

All the genera of Mammalia, described in this report, are distinct from those *now* existing, and more than half are entirely *new*, and furnish among other extraordinary animals an extinct species and genus of Ruminant, which supplies a link *hitherto* wanting in this family, and serves to connect more closely the present members of this order with the most ancient.

Two eminent foreign naturalists and geologists once remarked to me, that from the vast scale of our geological formations and the great abundance of included organic remains, this country must necessarily furnish many new and important facts to remove the difficulties and make clear the obscurities that now environ some portions of European geology. And I believe, that before long, this science will throw much light upon the question of the original birthplace of the human family. But my object is to call attention to this report, and I have taken the trouble to write out a few extracts, which are at your service, from the description of the *Mauvaisses Terres*, or Bad Lands, situated on the head waters of White River, a tributary of the upper Missouri, and about in latitude 42 deg. and longitude 36 deg. west from Washington. If I mistake not, these extracts will prove acceptable to your readers.

Mauvaises Terres, (Bad Lands).—After leaving the locality on Sage Creek, and crossing that stream, and proceeding in the direction of White River, about twelve or fifteen miles, the formation of the Mauvaises Terres proper, bursts into view, disclosing as here depicted, one of the most extraordinary and picturesque sights that can be found in the whole Missouri country. From the high prairies that rise in the back ground, by a series of terraces or benches, towards the spurs of the Rocky Mountains, the traveller looks down into an extensive valley, that may be said to constitute a world of its own, and which appears to have been formed, partly by an extensive vertical fault, partly by the long-continued influence of the scooping action of denudation.

The width of this valley may be about thirty miles, and its whole length about ninety, as it stretches away westwardly, towards the base of the gloomy and dark range of mountains known as the Black Hills. Its most depressed portion, three hundred feet below the general level of the surrounding conntry, is clothed with scanty grasses, and covered by a soil similar to that of the high

er ground. To the surrounding country, however, the Mauvaises Terres present the most striking contrast. From the uniform, monotonous, open prairie, the traveller suddenly descends one or two hundred feet, into a valley that looks as if it had sunk away from the surrounding world; leaving standing all over it, thousands of abrupt, irregular, prismatic, and columnar masses, frequently capped with irregular pyramids, and stretching up to a heighth of from one to two hundred feet or more. So thickly are these natural towers studded over the surface of this extraordinary region, that the traveller threads his way through deep, confined, labyrinthine passages, not unlike the narrow, irregular streets and lanes of some quaint old town of the European Continent. Viewed in the distance, indeed, these rocky piles, in their endless succession, assume the appearance of massive, artificial structures, decked out with all the accessories of buttress and turret, arched door-way and clustered shaft, pinnacle, and finial, and tapering spire. One might almost imagine oneself approaching some magnificient city of the dead, where the labor and the genius of forgotten nations had left behind them a multitude of monuments of art and skill. On descending from the heights, however, and proceeding to thread this vast labyrinth, and inspect, in detail, its deep, intricate recesses, the realities of the scene soon dissipate the delusions of the distance. The castellated forms which fancy had conjured up have vanished; and around one, on every side, is bleak and barren desolation. Then, too, if the exploration be made in midsummer, the scorching rays of the sun pouring down in the hundred defiles that conduct the wayfarer through this pathless waste, are reflected back from the white or ash-colored walls that rise around, unmitigated by a breath of air, or the shelter of a solitary shrub. The drooping spirits of the scorched geologist are not permitted, however, to flag. The fossil treasures of the way, well repay its sultriness and fatigue. At every step, objects of the highest interest present themselves.

Embedded in the debris lie strewn, in the greatest profusion, organic relics of extinct animals. All speak of a vast fresh water deposit of the early tertiary period, and disclose the former existence of most remarkable races, that roamed about in by-gone ages high up in the valley of the Missouri, towards the sources of its western tributaries; where now pasture the big horned *Ovis Montana*, the shaggy buffalo or American bison, and the elegant and slenderly constructed antelope. Every specimen as yet brought from the Bad Lands, prove to be of species that became exterminated before the mammoth and mastodon lived, and differ in their specific character, not alone from all living animals, but also from all fossils obtained even from contemporaneous geological formations elsewhere. Along with a single existing genus, the rhinoceros, many new genera never before known to science, have been discovered, and some, to us at this day, anomalous families, which combine in their anatomy, structures now found only in different orders. They form, indeed, connecting links between different orders. For example, in one of the specimens from this strange locality, we find united characters belonging now to three orders. Another, the *Oreodon*, has grinding teeth like the elk and deer, with canines resembling omniverous, thick-skinned animals; being, in fact, a race which live both on flesh and vegetables, and yet chewed the cud like our cloven-footed grazers!

Associated with these extinct races, we behold also, in the Mauvaises Terres, abundant remains of fossil Pachydermata, of gigantic dimensions, and allied in their anatomy to that singular family of proboscidate animals, of which the Tapir may be taken as a living type. These form a connecting link between the tapir and rhinoceros; while, in the structure of their grinders, they are intermediate between the damon and rhinoceros; by their canines and incisors they connect the tapir with the horse on the one hand, and the peccary and hog on the other. They belong to the same genus of which the labors of the great Cuvier first disclosed the history, under the name of *Palæothcrlum*, in publishing his description of the fossil bones exhumed from the gypsum quar-

ries of Montmatre, near Paris, but are of distinct species; and one, at least, of this genus, discovered on the Bad Lands, must have attained a larger size than any which the Paris basin afforded

A nearly entire skeleton of this animal was discovered, which measured, as it lay imbedded, *eighteen* feet in length, and *nine* in height. Besides these various remains of singular forms of Maminiferæ, there were also discovered many turtles, one of which was estimated to weigh a ton. These turtles were chiefly observed in a portion of the Bad Lands, some five or six miles in extent, which has much the appearance of an ancient lake. At one of these lake-like expansions, hundreds of fossil turtles were discovered.

THE ALMADEN (QUICKSILVER) MINE, CALIFORNIA.

In a letter by T. S. Hart, Esq., dated San José, Nov. 26, 1852, some very interesting particulars are stated respecting the rich quicksilver mine at Almaden:—

We left San José at 8 o'clock in the morning in a stage which plies daily, and after a ride of an hour and a half over a most excellent road, and through as beautiful and fertile a valley as the eye ever beheld, we arrived at the beautiful village of Almaden, distant twelve miles from San José. It is situated on the bank of a small stream of the purest water I have seen in California.

There is an excellent soda spring in the midst of the village, the water of which is considered as good as the Congress or Saratoga water. There is a large bakery near it, and they use the water in mixing up their bread, and certainly make as fine bread as I ever have eaten.

The works are much more extensive than I expected to find them. We called upon the superintendent, Mr. John Young, who treated us very courteously. The buildings are nearly all new, the old ones having been mostly removed. The loads of ore are brought down by the road to a level with the top of the furnace, where it is separated into coarser and finer pieces. The process of extracting the metal from the ore is very simple. The ore is placed in the furnaces, where a gentle and regular heat is applied. As it diffuses itself through the ore the quicksilver contained in it sublimes, and is afterwards condensed and falls by its own weight, trickles down and out at little pipes leading from the bottom of the chambers of the furnace, and empties into vessels so situated as to receive it. From these pipes we saw the quicksilver falling more or less rapidly in large drops. In one vessel there must have been from 15 to 20 gallons of quicksilver. Mr. Young informs me that they manufacture about 1000 flasks per month, each flask containing 75 pounds, making 75,000 pounds per month. The flasks are all of wrought iron. The time occupied in filling the furnace and extracting all the metal from a furnace full of ore, is about one week. When this is accomplished, the furnace is opened, that the mass of rock may be removed to make way for another batch of ore. When these ovens are first broken open, they have to be very careful not to approach them too soon, as the air is charged with the quicksilver escaping in the form of vapor, and if a person breathes it he is sure to be salivated.

After examining the works and the different processes we visited the mines, which are one and a fourth miles from the works. We procured an order from the superintendent for that purpose, as no person would be admitted without one. We started up a beautiful road cut in the side of the mountain, the road being about 25 feet wide, and rising on an angle of about 20 (?) degrees. About half way up we came to a locality of sulphate of lime, from which some fine specimens have been taken. (I also found some specimens of fluor spar and chalcedony near the soda spring.) After a fatiguing journey we reached the entrance to the mine, and handing our order for admission to the manager, who appeared to be a very gentlemanly man, we were furnished with a guide.

We entered a car which was pushed by our guide into the tunnel, which is a most substantial and masterly piece of workmanship, being arched over in a most thorough manner; it is about 900 feet in length, 10 feet wide, and 10 feet high, with a railroad extending the entire length. The tunnel is some 300 feet below the former outlet near the top of the mountain. We were now each furnished with a torch with which each must enlighten his own way. We were now in the bowels of the mountain with 350 feet of earth over our heads. The mouth of the tunnel did not appear as large as a man's head.

We soon commenced our explorations from chamber to chamber, which appeared to extend in a most intricate manner in almost every direction. Sometimes we descended a pole almost perpendicular for fifty feet, with merely little notches cut for the toes, and at other times ascended them. We finally came where the miners were at work; we heard the ringing of the drills and the strokes of the hammer, and on approaching nearer we could hear the measured groan or grunt with which they accompany each stroke that they make, and when I was convinced that it did not indicate pain, as its doleful sound led me to think, it became so ludicrous that I burst out into a hearty laugh. The miners are all Mexicans, and have been brought up to it from their infancy. Here was the richest *lead* they had in the mine; I obtained a number of specimens from it. They estimate that the chambers or avenues in a continuous line would extend a mile and a quarter; several have been abandoned on account of the danger of working in them.

We finally ascended to the upper outlet or that which was first executed by the Indians, who must have begun at a very early date, as they had penetrated the mountain more than sixty feet, which must have been a most arduous task with the rude stone implements they worked with. They sought the vermilion to paint themselves with. They must at times have met with terrible catastrophies; one chamber was pointed out which contained a large amount of human bones buried beneath the rock, which had evidently caved in upon them where they had made their excavations too wide. Having got out into daylight once more, we found ourselves near the top of the mountain, the view from which repaid us richly for our laborious ascent. There was spread out before us a vast extent of country, including the whole range of the valley of San José, and the bay with the land bordering it on either side, as far up as San Francisco on the west, and a point opposite to it on the east. Twelve miles from us on the plain was the town of San José, a little to the left the town of Santa Clara, and still further on the village of Alviso, and the Mission of San José on the table-land in the distance. This country is so rich and fertile, that when its agricultural merits are fully developed and brought to bear, it will feed and maintain all the population of California.

TIN MINE IN SOUTH AMERICA.

In the neighborhood of Onero, there is a Tin mine which has been worked to the depth of 600 feet. The amount of tin ore produced in the vicinity annually, is about three thousand tons. An extensive description of the mine was furnished to the New-York Courier, by its regular correspondent in that region. To this source we are indebed for the following particulars respecting a visit to this mine:—

Thus rigged, I entered the mine, one miner preceding and another following me, each with a lamp. The first obstacle was a pool of water for about ten rods. We then descended a long succession of tolerably well constructed stone steps. The clay of the mine was like oil, and great care was necessary to avoid a longer step at once than was compatible with comfort or safety; but I had as yet seen no necessity for the special rig which I had adopted. By and by we came to a horizontal but winding portion of the passage, which was only large enough to allow one to get through, and in width hardly that for me.

Whether to project myself head or feet foremost, was a question, but I gave the head the preference. I now saw the use of the knee-shields, but I substituted hands and toes for hands and knees. I thought there could be but one such passage in any mine, and took courage. I was right in the first idea, that is, I did not find another such passage; but the courage was out of place, for other passages were so much worse. The next was nearly vertical, and equally sparing in the space it afforded, the dimension of a section of it, I mean, for in length it was certainly ample enough. I had given the honorable position to the head in the previous instance, but fearing an apopleptic attack if I exercised the same discrimination here, I assigned the foremost position to my boots. Thus proceeding, upward and downward, horizontally and winding, we at length came to what was called the deepest part of the mine, but instead of turning back, we continued through the same intricate tube till we were again at the mouth of the mine where we entered it. I came out, a cylinder of mud, "of the earth, earthy," in a sense in which it was not true of me when I entered it.

The characters of the mountains on opposite sides of the Quebrada are altogether different. Both contain more or less of stratified rock, but the strata have different positions in the two mountains. The dikes have different directions, and the aspect of the two is quite different. One is not therefore entirely unprepared to learn that tin is found almost exclusively in one, while silver alone is found on the other.

The mine which I entered can hardly be regarded as a single vein. In every direction are branches more or less extended, often but a few yards, but sometimes a hundred feet or more. At the extremity, and often at intermediate points, is a miner with his lamp hung by a hook to his cap, loosening the vein-stuff from the rock in which it occurs, so that though there is nowhere a collection of workmen in the mine, yet the inside of the mountain for a great space around, is full of living beings. When the hour of labor for one set of hands has expired, their rush from the mouth of the cave together, and dispersion in different directions down the declivity, is quite an animated scene.

In this mine the ore, which is the Oxide of Tin, is found for the most part disseminated through a matrix of clay. The mass of it is in small crystal line particles, but these particles are often adherent so as to form pieces weighing several pounds. Recently, however, and in the deeper parts of the mine, they have found ore in the state of solid rock, not associated with clay, and which it has been found necessary to blast. Large quantities of gunpowder are now used in the mine, not because the solid ore is better, if it is as good, but because by obtaining this they get nothing but ore, while in the other case they have to lift by their own muscles twice as much clay as ore, through that long passage to the mouth of the mine.

The ore thus brought to the light is carried by lamas, about a mile, to where the process of washing is performed. The clay ore is first washed to free it from the clay. It is sometimes sufficiently pure without further process for the market. If not, it is treated like the rock ore. The rock ore is first crushed by a very rude instrument, namely, a large rock with a somewhat regular oval surface, placed upon another which has a nearly plane surface. A wooden bar is fastened to the top of the rocking stone, and two men keep it in motion, watching their opportunity on each side to remove that which is sufficiently powdered, and almost at the same instant throwing under the pieces to be crushed. The earthy portion breaks to powder, while the ore breaks only into fine sand. By washing, that is, by spreading it upon a slightly inclined surface and allowing a small stream of water to flow over it, skilfully stirring it in the mean time, nearly all the earthy parts are separated, while scarcely any of the ore is lost. In this state they call the ore of tin as well as of copper, barilla. And in this state it is found profitable both to buyer and miner to sell it.

The Government allows the copper barilla to be exported, but for some rea-

sons, it has required that tin shall be exported only in the metallic state. It has therefore been necessary to bring charcoal for smelting from the valleys of the Eastern Andes, and it has been difficult for proprietors to compete with the productions of similar mines in other countries. The evil has become so great that some remedy must come from some source. If in no other way, the pressure upon the Government will be so great as to compel them to yield, for it is natives, and not foreigners, who own these mines and work them.

But it is hoped that there may not be a necessity even for that. Within a few weeks coal has been discovered in this immediate vicinity. I have not seen the bed, but I have seen abundant specimens of the coal. It is not a part of the great coal series. Probably it is a product of the tertiary period, like the Brona coal, and therefore cannot be relied on as if it were of an older date, but it may be sufficient for the mining purposes of the region. It is found on the pampa, and it is by no means improbable that these extensive plains, which hitherto there has been thought to be no occasion at all for examining mineralogically, may every where contain the necessary fuel for mining purposes.—What a provision of Providence it would seem, if such mineral treasures have been stored up; but where forests cannot grow, it shall be found that when these plains were below the level of the ocean, perhaps before the minerals were deposited in their present positions, the vegetation of these mountains (then islands) was treasured up for the miner's use in these later times.

The tin from South America is employed almost exclusively for purposes of dyeing—it being very much superior to that smelted with mineral coal for such purposes.

These mines have been worked on a small scale for many years, even by the Spaniards; but foreigners, merchants in the cities on the Pacific side, have given a new impulse to the business, by purchasing with avidity either the metal in bars, or the barilla, which they send to England to be smelted. The business as yet has not become a leading interest of the country, but I see no reason why it should not rise to very considerable importance. I am persuaded that the ore exists in immense quantity. It is perhaps inexhaustible. In this immediate vicinity the present annual production is probably not far from three thousand tons, and brings here generally $180 per ton.

A SULPHUR MINE.

Mr. E. Pinyret, an artist of Mexico, has published in that city, a minute description of a daring ascent to the summit of the celebrated volcano, Popocatepetl. Probably the crater of that furnace has never been so well described as in this account.

In spite of the ridiculous orders of the Governor of Puebla, who calls himself proprietor of the volcano, I managed to ascend it, descend into the crater, paint there, and sleep there.

After having mounted about 3000 feet upon the steep side of the eternal snows that crown the volcano, it appeared to me impossible to sit down to take a lunch. The lip of the wide mouth of the crater, which appears to you suddenly, presents an angle almost acute, the outer side of which is covered with ice and snow, that has been partially melted by the warmth of the summer's sun. The interior is nearly perpendicular; for half the distance down there is a steep path made by the workmen of the sulphur mine. The path descends on pieces of lava, scoriæ and ashes, to a projecting point of lava that overhangs the crater. On this point a work place has been constructed for the working of the mine, and alongside is a cabin for the workmen. The cabin resembles a dog's kennel; but it is the hotel of Popocatepetl. From the cabin down to the crater is about two hundred yards; but in descending by the cord the adventurer alights on the declivity of the sulphur mine, and then descends another hundred yards to the bottom. It is with difficulty that the voice of one below

can be heard; and for a person below to hear another above is impossible. That may give an idea of the distance, which has never been accurately measured.

The bottom of the crater might be compared to a vast caldron, that had been filled with a boiling mixture, the scum of which had remained on the sides and suspended over the hollow left by the cooling This scum is the *solfatara*, the sulphur mine, which has been the object of a long-standing law-suit between the two rival claimant companies.

The void over which the *solfatara* rests is beyond doubt in a state of fusion, and liable at any day to new eruptions, which may have an important influence on the sulphur mining companies' stocks. In some parts of the crater streams of smoke escape, and in other parts there are puffs with detonations. A cane thrust down one of these vents is burnt off in a very short time—pretty strong evidence that the fire is not far distant. The sulphurous gas from these chimneys is suffocating. In some places it has sufficient strength to hold together, and be visible above the top of the crater; and little streams of gas, which are soon lost, escape all about the sides.

The upper circumference of the crater is about four and a half miles, but it would be impossible to walk around it, as is done at Vesuvius. The crater of Vesuvius, compared to that of Popocatepetl, is like half the shell of a hen's egg compared with half the shell of a goose's egg. Only the crater of Ætna can be placed on a parallel with Popocatepetl, but even that has not the majesty, nor the regularity, nor the remarkable character of the latter.

The picture which I have made of the interior of the crater of Popocatepetl, and which, I believe, is the only one that has been made, represents the half nearest Puebla. The different layers, as placed by succeeding eruptions, are plainly visible. The topmost layer is about twenty-five inches in depth, and is composed of black scoria. Upon this last layer is a coat of ice fifty feet thick, running up to a sharp edge, and tinged with a beautiful green on the inner surface. The ice is full of fissures and rough projections, inaccessible to man, so that I was unable to place myself upon any part of it to make a panoramic design, as I wished to do. Looking down upon the valley, nothing can be seen except the vapors of the *tierra caliente* (lowlands), and three or four high peaks—among others, the peak of Orizaba, towering above the clouds.

The other half of the interior circumference, which is next to Mexico, is more picturesque by reason of its rough character. I made a drawing of it, but the overseer of the rancho of the sulphur font, after permitting himself to be seduced to permit me to make the ascent with my men, stole the drawing, to prove his zeal and fidelity to the Governor of Puebla. I had sent to the latter for authority to ascend, and he had answered negatively, with an additional order probably to take my sketches. The overseer opened my box of colors whilst I was resting after my descent, and took one of the six designs I had made during the trip.

Here is some advice to those who may wish to ascend Popocatepetl: they can leave Mexico and arrive at the rancho of the sulphur font, and at 6 o'clock on the next morning begin the ascent. It is useless to attempt to mount the crater before sunrise; it is five hours' walking from the rancho to the crater; it would be necessary to start at midnight, and the route through the forest, over trees blown down by hurricanes, and over ice, would be extremely dangerous. I think that no one will get to see the sun rise from the crater without staying there over night; but for two months at this season of the year the beautiful panorama is hidden by the mists of the *tierra caliente*. After leaving the rancho you can travel two hours on horseback through a fine forest and over volcanic cinders, to the beginning of the ice. The remainder of the journey, up 3000 feet of perpendicular height, over ice and snow, must be accomplished on foot.

The inclination of the lower part of the ascent on the ice is about 35 degrees; it is terrifying to look back. The declivity, becoming more steep by the melting of the ice, is more perceptible below than above; the whole having the form of a convex curve, exceedingly difficult to mount. There is but one

recipe for those making the ascent; it is to have a vigorous pair of legs. Mine unfortunately carry the weight of seventy years, and they failed me several times on the route. It is scarcely necessary for me to say that the five persons that I had invited to help me, abandoned me completely on the ice.

The last ascent demands three hours. The following day the traveller can descend and arrive at the city of Mexico. I started from the crater at 4 o'clock in the morning, and arrived in the city at 5 in the evening. The whole trip, to be well made, demands three days, and thirty dollars, and the permission of the Governor of Puebla, who, unfortunately, is no friend to the natural beauties of his country.

It is a common error to believe that the rarefaction of the air on the summit is injurious to respiration. The excessive fatigue of the journey takes away the breath, and breaks down the physical forces, but that is all. Once arrived at the top, and sheltered by the crater, there is no feeling of pressure. The workmen who labor two weeks in succession in the sulphur mine, often descend and mount twice in a day over the icy steep of which I have spoken; but for all that they have sound lungs.

GWYNNE'S REACTION CENTRIFUGAL PUMP.

At a period when several valuable workings have been either partially or wholly neglected, from the absence of any efficient and economical means to get rid of the water, it becomes a matter of much consequence to the miner to be made acquainted with any new aids which recent improvements may afford him for this purpose.

This pump is constructed upon an entirely different principle from all the ordinary pumps in use. The principle is the same as that of the blowers for the furnaces of steamboats and for blast furnaces. Every one knows the irresistible force with which the air rushes out of these blowers upon the fires. So in this case, the water enters at the sides of a disc, the rapid revolution of which imparts to it a centrifugal force, which causes it to rush out at the spout with wonderful velocity. Some idea of its torrent-like force may be obtained from the fact that it causes a hundred gallons to pass through a two-inch pipe in a minute at a moderate speed. These pumps are extremely portable, easily set in operation, and not liable to get out of repair, or to be choaked by pebbles, or other foreign matter. In mines, or excavations of any kind, they are the most convenient, rapid and substantial machines we possess for the removal of water, and must unquestionably supersede all other pumps for such purposes.

From an examination of the working of these pumps, we recommend them to the attention of all parties having use for such machines, confident that they will confirm our opinon of their superior merits. The Union Power Co. of the United States, located in this city, is the only establishment at which these pumps can be obtained.

A NEW MOTIVE POWER.

To the Editor of the Mining Magazine.

The necessities of the age require a new motive power. The steam engine has become burdensome to man; it has had its day; the progress of the age requires a more portable and powerful agent than steam. The caloric engine is a failure, and the carbonic acid engine is difficult to manage. Who is to confer the blessing upon mankind of giving them a new motor? Within the life-time of many now living, a new engine, simple, cheap, compact, and powerful, is to take the place of the cumbersome semi-barbarous machine called Watt and Fulton's Steam Engine, which will only be exhibited in museums, where useful implements shall be kept to show the progress of civilization.

MOTOR.

RECENT PUBLICATIONS.

There is a large number of volumes constantly issuing from the press, the contents of which relate more or less directly to the objects of the '*Mining Magazine.* Some treat of distinct branches of the general subject, and are able, instructive, and valuable. Such cannot be passed over without notice by us, if we would carry out in full the plan of our publication. Happily these works are of such importance as often to become the subject of a general article, but by far the larger number contain hints and observations, or facts, and summary statements, of useful and interesting information to all our readers. It is, therefore, to furnish those who are interested in mining operations with a knowledge of whatever is published in relation thereto, with criticisms upon the contents, worth and merits of each work, that we have added the following additional department to the original plan of this Magazine. Of the manner in which it will be executed, we will venture to say a word. It will be conducted with a liberal hand, not consisting of mere notices of the contents and literary merits of a book, but extracts will be made whenever necessary to illustrate the nature of the volume, and whenever they possess interest and instruction for our readers. Such a course is the only one consistent with advantage to publishers of books, and the readers of a periodical; and while it may be acceptable to the former, it cannot be otherwise than gratifying to the latter. On all other points, whatever may be written must be judged by its own merits.

Scenes and Adventures in the Semi-Alpine Region of the Ozark Mountains of Missouri and Arkansas, which were first traversed by De Soto, in 1851. By Henry Rowe Schoolcraft. 8vo. pp. 256. Philadelphia—Lippincott, Grambo & Co.

The term Ozark, as used in this title, is applied to a broad, elevated district of highlands, running from north to south, centrally, through the States of Missouri & Arkansas; on the east is the deep track of the Mississippi, and on the west the plains or deserts which stretch below the Rocky Mountains.

It was as early as 1818, when the adventures described in these pages took place, and it may occasion surprise in the reader at their publication at this late day. They occurred upon the first and only attempt which has been made to identify the march of De Soto, the bold Spanish explorer, west of the Mississippi, and they present reminiscences of observations which belong to the history of the discovery and settlement of the country.

The Appendix, which comprises about half the volume, consists of a number of papers likewise written at that early day, upon "The Mineralogy, Geology, Antiquities and Geography of the Western Country." It presents a very complete description of the Lead Mines of Missouri, with cuts representing the furnaces then in use. The state of these at that period—the year 1818, is thus described:—

Respecting the present state of the lead-mines, it is only necessary here to add, that they are worked in a more improved manner than at any former

period; that they are more extensive than when the country came into the hands of the United States, and of course give employment to a greater number of miners, while every season is adding to the number of mines; and that the ores may be considered of the richest kind. Every day is developing to us the resources of this country in minerals, and particularly in lead; and we cannot resist the belief that, in riches and extent, the mines of Missouri are paralleled by no other mineral district. In working the mines, in raising and smelting the ore, and in the establishment of the different manufactures dependent upon it, there is much to be done. Though the processes now pursued are greatly superior to those in use under the French and Spanish governments, there is still ample room for improvement. The earth has not yet been penetrated over eighty feet! We know not what may be found in the lower strata of the soil. There is reason to believe that the main bodies of ore have not yet been hit upon; that they lie *deeper*, and that we have thus far only been engaged upon the spurs and detached masses. There is also reason to believe that bodies of the ores of zinc exist in the district of the mines, and that copper will be afforded by the lower strata of earth. It is found overlaid by lead-ores in many of the European mines; and the geognostic character of the country leads us to conclude that it may also be found here.

The want of capitalists in the mine country, and of practical skill in the boring, blasting, sinking shafts and galleries, oppose obstacles to the successful progress of mining. There is but one regular hearth-furnace for smelting in the whole district; and that is on the modern plan of English furnaces. There are not over four or five regular shafts in about forty mines; there is not an engine, either by horse, steam, or water power, for removing water from the mines, several of which have been abandoned on this account, with rich prospects of ore in view. In fine, there is little of that system which characterizes the best-conducted European mines, and which, by an application of the most recent discoveries in mechanics, chemistry, and philosophy, render them the admiration of every intelligent visitor. Should the subject attract the attention of mining capitalists, the circumstance would form a new era in the history of the mining operations of this country. Something also remains to be done by the government; the existing laws are inadequate to the purposes for which they were enacted. That feature restricting leases to three years, is injudicious; the period is so short, that it deters those who are most able from engaging in it at all. It is desirable that such a system should be established as would indicate the annual produce of the mines, number of hands employed, and such other facts as are necessary in forming a series of statistical tables on the subject. The want of such data has hitherto prevented us from properly estimating the importance of the mines in a national point of view. The acquisition of a scientific knowledge of minerals should also be facilitated in this quarter. There should be a mineralogical school located in the country, where students might be instructed in that useful science. In a country so rich in minerals, and whose wealth will always so much depend upon a proper development of these resources, the knowledge of mineralogy should be laid open to every one, and should be within the reach of such as do not wish, or cannot get, the other branches of a liberal education. To obtain this knowledge now, a person would be compelled to travel to remote parts of the Union, and to incur an unreasonable expense. No one who is conversant with the advantages which Germany has derived from such a seminary, will deny the utility of a similar one in the United States.

Yet, with all the disadvantages under which the lead-mines have been viewed, there are many who may be surprised to find their annual products, from the best information, stated at three millions of pounds; and from this some idea may be formed of their riches and extent, and when they come to be properly and regularly worked, how greatly they will contribute to the national wealth.

THE

MINING MAGAZINE.

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

CONTENTS OF NO. III., VOL. I.

ARTICLES.

ART.		PAGE
I.	GOLD AND SILVER PRODUCED BY THE MINES OF AMERICA, FROM 1492 TO 1848	219
II.	REPORT ON THE MANASSAS MINING PROPERTY. By PROF. BENJAMIN SILLIMAN, JR.,	228
III.	THE MINES AND MINERAL RESOURCES OF AMERICA, NO. 3 ...	232
IV.	ANALYSIS OF SOILS. By ANDREW URE, M. D., F. R. S. WITH REMARKS ON AGRICULTURAL GEOLOGY. By PROF. CHARLES STEARNS	235
V.	REPORT ON SHELBURNE LEAD MINES. By DR. CHARLES T. JACKSON	245
VI.	THE ARTESIAN WELL AT CHARLESTON, S. C. By R. N. LYNCH, D. D.	251
VII.	PARTICULARS RELATIVE TO THE LEAD MINE NEAR NORTHAMPTON, MASS. By BENJAMIN SILLIMAN, L. L. D. &c.	256
VIII.	THE COPPER AND IRON REGION OF LAKE SUPERIOR	261

JOURNAL OF MINING LAWS AND REGULATIONS.

An Amendment to the Act, authorizing the Formation of Mining Corporations in New-York 268
Act to authorize the Formation of Mining Corporations in New-York 269

COMMERCIAL ASPECT OF THE MINING INTEREST.

Mining Stocks in New-York 273
Fluctuation in Mining Stocks at the N. Y. Exchange Board 274
Mining Stocks in Boston 275
Fluctuations in Mining Stocks at the Boston Exchange Board 276
Importations of Metals, Coals, &c., at New-York 277

JOURNAL OF GOLD MINING OPERATIONS.

Annual Production of Gold 277
Gold Yields Estimated for Different Periods 277
" coined in United Kingdom in fifty years 277
" " in United States in fifty years 278
" " in France " " 278
" coinage at U. S. Mints in June 1853 278
California Gold Fields 278
Produce of " " 278
Australian " " 281
Purity of Australian Gold 281
Gold Mines in Peru 283
Gold in Oregon 284
" in New Grenada 284
How the Great Gold Nugget was Found 285
Gardner's Magnetic Gold Washer 287
Newton's Gold Washer 288
Buffum's Amalgamator 288
Berdan's Crusher and Amalgamator 289

JOURNAL OF COPPER MINING OPERATIONS.

PAGE
Produce of Copper Mines of Cornwall since 1845 290
Quantity of Copper produced in the several districts of Great Britain and Ireland 290
North Carolina Copper Co 290
Mining in East Tennessee 292
System of Copper Mining Operations at Lake Superior 293
Progress of Operations at the Lake Superior Mines 295
The English and Australian Copper Co 296
Fire Proof Bronze Color for Copper and Brass 297
Detroit and Waterbury Copper Smelting Work 298
Babbit's Metal 298

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

Product of Silver at Different Periods 299
Silver Coinage in Fifty Years in England, France, and the United States 299
" " for June, 1853 299
New Silver Coinage of United States 299
Silver Coinage in Mexico 300
Lake Superior Silver Mining Co 300
Analysis of Ore 300
Silver Mines at Potosi, S. A. 301
Middletown Lead Mines 303
Produce of Lead in Great Britain 303
Exhibition of Lead at the Crystal Palace, London 306
North, East and Southampton Lead Mines 307

COALS AND COLLIERIES.

Anthracite Coal Trade for 1853 308
Cumberland Coal Trade 308
Report of the Pennsylvania Coal Co. for 1852-3 308
An Anthracite Coal Mine 309
Maryland Coal Region 310
Analysis of Parker Vein Coal 311
Coal in Michigan 312
" Mining in Prussia 312
Shipments of Cumberland Coal from July 1846 to July 1853 313
Coals in England 314
Coal Fields of Europe 314

IRON AND ZINC.

Manufacture of Iron from Lake Superior 315
Burnt Lime instead of Limestone as a Flux in Blast Furnaces 319
The Iron Manufacture of Great Britain 320
Manufacture of Wrought Iron direct from the Ore 321

QUARRIES AND CLAYS.

Porcelain, its Manufacture 322
" its Appearance in the American Exhibition 324

MISCELLANIES.

Tin Manufacture of Great Britain 326
Wire Ropes, Hemp Ropes, and Chains 326
Brand's Liquid for Steam Boilers 326

RECENT PUBLICATIONS.

Dictionary of Arts, Manufactures and Mines 327
American Polytechnic Journal 328

THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. I.—SEPTEMBER, 1853.—No. III.

Art. I.—GOLD AND SILVER PRODUCED BY THE MINES OF AMERICA FROM 1492 TO 1848.

With the exception of statements made by some of the early adventurers of the amounts of gold obtained of the aborigines in particular instances, there is little else than conjecture as to the amount of the precious metals gathered by the early discoverers of America. Humboldt, whose opinion is perhaps entitled to more confidence than that of any other writer, has estimated the average annual amount of gold which America furnished to Europe, from 1492 to 1500, at 52,000*l.* sterling.

According to the accounts of Herrara and others respecting the operations of the early adventurers, the estimate of Humboldt would seem correct for the whole period from 1492 to 1519, when Cortez first landed in Mexico. Up to this period gold only had been found. Twenty years after the conquest of Mexico, that of Peru was made by Pizarro. The process by which the Peruvians had procured their gold and silver before the arrival of the Europeans was simple, rude, and with little regard to extracting the whole of the precious metals from the ores. The use of mercury was not adopted till forty years after the conquest. The smelting was performed in small portable furnaces, or cylindrical tubes of clay, very broad, and pierced with a great number of holes. In these the Indians placed layers of silver ore, galena and charcoal, and the current of air which entered the holes, quickened the fire and gave it a great degree of intensity. These furnaces were moved from one elevation to another, according to the degree of high or low wind. When it was found that the wind blew too strong and consumed too much of the fuel, they were removed to a lower situation. By these means the natives obtained argentiferous masses, which were smelted again in their own cottages. This was performed by a number of persons, ten or twelve at a time, blowing a fire through copper tubes, from one to two yards

in length, pierced with a small hole at the extremity toward the fire, which thus acted in the same manner as the modern blowpipe.

The mines of Potosi were discovered in 1545. Several mines had been previously worked, but there is no account of the gold and silver which they yielded. The estimate of Humboldt up to this time, which is adopted by all the leading writers, is as follows:

The annual addition in twenty-nine years, between the discovery in 1492 and the conquest of Mexico in 1521, at £52,000, would amount to	£1,308,000
The amount for twenty five-years, from the conquest of Mexico to the discovery of Potosi, at the annual rate of £630,000	15,750,000
Total addition in 63 years . . .	£17,058,000

Writers have estimated that the quantity of gold and silver in the old world had been reduced to thirty-three or four millions, and that the supply of the European mines at the discovery of America was equal to that which was annually consumed by wear.

The discovery of the mines of Potosi was accidental. It was made by an Indian hunter, Diego Hualca, who, in pulling up a shrub, observed filaments of pure silver about the roots. The mass on examination was found to be enormous, and a large part of the population was attracted to the spot. A city soon sprung up. The mountain was perforated on all sides, and the produce in a few of the first years exceeded whatever had been recorded of the richest mines of the world.

During the first ten years after the discovery no account was kept of the quantity of treasure obtained, but during the succeeding twenty-three years, from 1556 to 1578, a tax of a maravedi upon each marc of silver was laid. The account of this tax gives as its amount nine millions eight hundred and two thousand two hundred and fifty-seven peros, and the treasure therefore must have amounted to $49,011,285, or $2,130,925 annually. Humboldt and other writers have concluded that the yield of the mines did not exceed during the first ten years that of subsequent and equal periods. This opinion is based upon the improved processes of amalgamation introduced after the end of the ten years. During the next twenty-one years, from 1579 to 1600, the amount of treasure according to the tax was $29,185,990; or $1,389,859 annually.

During this period Chili yielded some gold, but the principal supply of treasure came from Mexico. Humboldt is chiefly followed by all writers in the estimate of the annual supply during all this period, which is reckoned at $10,000,000. This in the period of fifty-four years, terminating at 1600, would amount to $540,000,000.

It would be an interesting subject to investigate the influence which this accumulation of treasure had upon the social condition of the inhabitants of Europe. The advance in prices, the rise in wages, the increase of luxury, and the more general diffusion of comforts, are distinctly marked in the pages of history.

The sum which formed the stock of money current in Europe at the latter end of the sixteenth century, is thus estimated by one of the most laborious English writers who has investigated the subject.

1st. The stock existing at the time of the discovery of America	£34,000,000
2d. That produced in the hundred and twelve subsequent years, after making allowance for the loss by wear and tear	138,000,000
	172,000,000
Deducting what had been conveyed to Asia, and what is supposed to have been applied to the purpose of commodities of all kinds	42,000,000
	£130,000,000

This is equivalent to quadrupling the quantity of coin in Europe in the first century after the discovery of America. A conclusion which will admit of great difference of opinion.

After the year 1600 the mines in the district of Potosi in Peru declined greatly. In the first fifteen years of the seventeenth century they yielded $1,670,344 ; and in the last fifteen years, from 1685 to 1699, both years inclusive, the average amounts to no more than $559,943. This decline is not ascribed to the exhaustion of the mines, but to the cruel conduct of the Spaniards.

During the same period, the district now known as Bolivia, was productive of metals. Mines were opened and worked in Carangas, Oruro, Andacava, and Chaquiapu or La Paz. At the same time, the silver mines in the northern part of Peru at Gauricocha or Pasco, were opened, and yielded a large amount of that metal. Thus although the district of Potosi declined, the other parts of Peru advanced so considerably as more than to compensate for the deficiency. This increase of silver was greatly promoted by the extension of the mines of mercury at Huancavelica. The quantity at first obtained from them was small, compared with that which they reached between the years 1598 and 1684, after which they appear again to have declined. The principal one of these mines became choked up about 1790, which was a great misfortune to the mining interest of South America. The superintendent of that day removed the pillars which had been left by the excavators of the galleries to support the roof. By the superincumbent pressure the roof fell in, and the passages became blocked up. " The master miners," says Humboldt, " accused

the intendant of having removed the pillars to ingratiate himself with the court of Madrid, by procuring in a very few years a great quantity of mercury. The intendant on his part affirmed, that he had acted altogether with the consent of the master miners, who thought the pillars might be replaced by heaps of rubbish."

Meantime the increase of gold was taking place both on the north and south of Peru. In Chili the Spaniards and Indians were sedulously employed in washing for gold in those streams which descend from the Cordilleras. The climate and soil, there, are exceedingly favorable to gold washers. "It is usually observed," remarks a traveller who visited that country, "that in those countries where great mineral riches exist, the soil is of a barren and unproductive nature; but Chili affords a striking and almost solitary exception to this rule. Streams abounding in gold wander through the most luxuriant corn-fields, and the farmer and the miner hold converse together on their banks."

At this period some silver, but more gold, was found in New Grenada, but the principal quantity of gold was obtained in the ravines of the mountainous regions of Antioquia in the valley of Cauca, between the central and western Cordilleras, and especially in the southern extremity of the province of Popyan.

About the year 1630 the mines of Guanaxuato in Mexico were greatly extended, and those of Tasco, Zultepec, Zacatecas, and Pachuca began to improve, and so continued to the end of the century. The ancient documents on the subject of the product of treasure are very obscure, but Humboldt has concluded that the precious metal produced in Mexico so increased between 1600 and 1700, that in the last ten years of the century the mines delivered to the mints, in gold and silver, to the amount of more than five million piastres. It is estimated by Jacobs, that South America, exclusive of Brazil, yielded during the century terminating in 1700, in conjunction with the produce of Mexico, $10,500,000. Brazil is estimated at another million, and the amount not reported at the Mexican mints, but conveyed away by contraband means, is estimated at $2,000,000. Thus we have an annual yield from all the American mines, of $13,600,000 for the hundred years terminating in 1700.

The following estimate of the coin in circulation at the end of 1699, throughout the world, may be new to many of our readers, and may also serve as a landmark in the progress of our subject.

Stock of coin left at the end of 1599	£130,000,000
Deduct for abrasion and loss in the course of the century past	43,000,000
	87,000,000

Produce of the mines of the world in one hundred years	£337,500,000	
Transferred to India and China	33,250,000	
	£304,250,000	
Deduct one fifth converted to other objects than that of coin	60,250,000	
	£244,000,000	
Deduct for wear and tear	34,000,000	
		210,000,000
		£297,000,000

The produce of mineral treasure from this period was slow, but uniform, throughout America, until nearly the close of the century. The great mine of Valenciana, says one of the writers upon this period, which during forty years yielded to its proprietors a clear profit of from eighty-five to one hundred and twenty-five thousand pounds sterling yearly, was neglected until near the year 1760, and after ten years' labor and expenditure, when the richest part of the vein had been reached, continued for upwards of forty years to yield more than half a million sterling in gold and silver. The rich district of Guanaxuato, in Mexico, which in the years before 1766, yielded only three hundred and eighty thousand ounces of silver annually, produced in the latter years of its prosperity more than one million five hundred thousand. The mineral repository of Catorce was only discovered in the year 1773, but it yielded a very large quantity both of gold and silver till 1798, when the value of the minerals declined. The vein of Biscaina did not become enormously productive until 1762. In twelve years from that period, the owner of it gained a profit of more than a million sterling, with part of which he presented to the king of Spain two ships of war, one of them of one hundred and twenty guns, and also lent him upwards of two hundred thousand pounds, which was never after repaid. The mines of Zacatecas, which in 1750 scarcely furnished silver to the amount of more than one hundred thousand pounds, increased in a few years to ten times that amount.

The following is the statement of the product of the mines of Mexico, in gold and in silver, delivered to be coined at the several mints in periods of ten years, reduced to sterling at the rate of four shillings and two pence the piastre, according to Humboldt and Ward.

In the ten years from		1700 to 1709	£10,777,298
"	"	1710 to 1719	13,697,297
"	"	1720 to 1729	17,131,921
"	"	1730 to 1739	18,860,355
"	"	1740 to 1749	23,302,633
"	"	1750 to 1759	26,197,936
"	"	1760 to 1769	23,505,012

In the ten years from 1770 to 1779	. . . .	£34,912,858
" " 1780 to 1789	. . . .	40,318,948
" " 1790 to 1799	. . . .	48,191,711
" " 1800 to 1809	. . . .	47,142,814
		£304,039,783
It is estimated by Humboldt that the gold and silver of Mexico which did not pay the duty to the king was equal to one-fifth of that which did. Taking it at that amount there may be added	. . . . . .	60,807,956
		£364,847,739
This is an annual average product of	. . .	£3,316,706

The greatest quantity of silver from Peru has been extracted from the mines of Pasco. They are in the midst of mountains covered with perpetual snow, and are themselves at a height of thirteen thousand feet above the level of the sea, and consequently in a severe climate and a barren soil. They are said to contain masses of silver equal to the quantity found in the district of Guanaxuato in Mexico, and at no great depth below the surface. But the unhealthiness of the climate, the expense of conveying necessaries to such an elevation, and the water by which the pits are often submerged, have been impediments to extensive operations. Nevertheless these mines yielded subsequently to 1700, even throughout the century, annually eight hundred thousand ounces of silver. In the province of Truxillo, the Hualyayae, Gumachuco and Conchuco mines have been worked since 1772, and yielded annually eight hundred thousand ounces of silver. The ores of the district were said by Humboldt to be richer than those of Potosi.

The gold and silver obtained from the mines in Peru was ordered to be brought to Lima to be coined. No regular returns of the amount are attainable of an earlier date than 1754. The gold and silver which paid the duty on coinage from this date to 1809, was 240,408,058 piastres. Writers upon this subject, especially Jacobs, have reckoned the amount the same for the preceding fifty-nine years, and thus concluded the amount of gold and silver yielded by the mines of Peru for the one hundred and ten years previous to 1810, to have been $480,816,116.

The western part of Columbia has yielded gold from the earliest period, but no silver of account. The gold is obtained in alluvial districts. Veins have been found in the mountains of Guamoco and Antioquia, but the working of them has been neglected. The gold obtained from the washing was coined, and paid duty at Santa Fe de Bogota. In 1801 it averaged 2,500,000 piastres, from which amount it had not varied materially for a long period.

The gold and silver obtained in Chili was coined at the capital, Santiago, where the tax was collected. It amounted to about $850,000, annually, and for the period from 1700 to 1810, it is estimated that the gross yield of the mines and washings was $93,500,000.

Buenos Ayres, which at one time included the mountain of Potosi, had many rich mines about this period, especially La Paz, Carangas and Oruro. The annual product of which is stated by Humboldt to have been $4,200,000, or in one hundred and ten years, $462,000,000.

Bringing together under one view, the products of the gold and silver mines of Spanish America, and regarding the amount of contraband, or which did not pay a tax, we have the following results :—

Peru	£100,169,524
Columbia	57,341,666
Chili	19,532,166
Buenos Ayres	96,250,000
Product paying duty	273,293,356
Product on contraband	68,323,339
	341,616,695
Product of Mexico as stated above	364,847,739
	£706,464,434

But Brazil belonged to the Portuguese, and its product of gold must be added to the amount of gold and silver obtained in Spanish America. In the appendix to the report of the Bullion Committee of the English House of Commons in June 1810, there is an account of the product, or duty of one-fifth, from the 1st August 1751 to December 1794, for the two greatest mining provinces of Brazil, those of Minas Geraes, and of Minas Novas; and also of the district of Goiazes. By this statement, it appears that there was a decrease in the amount of the quintos on gold as follows:

	Arobas.	Mures.	Ounces.
Annual average from 1752 to 1762	104	7	5
" " 1763 to 1773	90	3	1
" " 1774 to 1784	69	20	4
" " 1785 to 1794	45	41	5

Thus the tax of one-fifth the weight amounted to 3,369 arobas of gold; the value of each aroba in sterling is £1,821 17*s.* 4*d.* Consequently, the whole amount produced from the mines in fifty-one years was £30,719,335. The yield of the other mines for the same period is estimated at £9,281,665.

The only method without statistics, which do not exist, by which to arrive at the results of the preceding period of fifty-nine

years, is through an investigation of the commerce of the period, with all those incidental circumstances which have a degree of influence upon it. After such an investigation, Jacobs, among other writers, has reckoned the amount produced as equal to that of the subsequent period, and the total from 1700 to 1810 at £80,000,000: thus

Spanish America as above	£706,464,434
Portuguese America	80,000,000
	786,464,434
Or an annual product of . . .	£ 7,146,767

Since the commencement of the present century, the product of the mines originally of Spanish and Portuguese America has rapidly declined. This has been in consequence of political disorders and wars, and not from any failure in the mines. Thus in Mexico, the money coined at the mint in 1809 was $26,172,982 in gold and silver; but in 1812 it had declined to $4,409,266. In Guanaxuato, according to Mr. Ward, the amount of the precious metals diminished from 8,852,472 marcs of silver, and 27,810 marcs of gold, the product of fifteen years preceding the revolution, to 2,877,213 marcs of silver, and 8,109 marcs of gold. The mines of Sombrerete declined from five hundred thousand to three hundred thousand annually. The product of the mines of Catorce, which was second only to that of Guanaxuato in the amount of silver raised, being nearly three millions of dollars annually, was so reduced as to yield, on the average for the fifteen years of the revolution, $599,400. The Bisciana vein, which yielded $857,042 annually, declined during the period from 1809 to 1823, to $14,285 annually. In each district the principal mines, with a single exception, were abandoned; the machinery was allowed to go to ruin, and the silver raised was merely the gleanings of more prosperous times; the workings were confined almost entirely to the upper levels. Reports have been made of the quantity of money coined at the four mints between 1810 and 1829, including both gold and silver. This amount is $220,403,183.

The produce of gold and silver in Central America was always included in the returns from Mexico previous to 1820. At that time a mint was established, which, up to 1829, had coined about $2,893,710.

The entire amount of gold and silver supplied by the late Spanish dominions in America, for the twenty years terminating in 1829, is thus estimated:

Mexico	$220,043,200
Guatimala	2,893,710
Columbia	33,564,267

Peru	64,688,429
Buenos Ayres	30,000,000
Chili	16,618,880
Brazil	19,892,400
	$387,700,886
Or at 4 *s.* 2 *d.* the dollar	£80,736,768

As early as 1824 gold was found in North Carolina; to wit, 1824, $16,000; 1825, $17,000; 1826, $20,000; 1827, $21,000; 1828, $46,000; 1829, $128,000. Also in Virginia, South Carolina and Georgia, small quantities were found at the same time.

A recapitulation of the amounts thus far stated, presents the following results of the produce of precious metals from the mines of America.

From 1492 to 1600	£130,458,000
1600 to 1700	337,500,000
1700 to 1810	786,464,434
1810 to 1829	80,736,768
	£1,235,159,202

We have thus far followed chiefly the estimate of Humboldt and Ward and Jacobs. Some discrepancy must necessarily exist in the absence of positive reports, between the results of every investigation.

For the following tables we are indebted to M. Michel Chevalier's *Remarks on the Production of the Precious Metals.*

Total Production of the Silver and Gold Mines of America prior to the Discovery of the Gold Mines of California.

Countries.	Silver.		Gold.		Total for each Country in Millions of Francs.
	Weight in Kilogrammes.	Value in Millions of Francs.	Weight in Kilogrammes.	Value in Millions of Francs.	
United States - - -	- -	- -	22,125	76	76
Mexico - - - -	61,985.522	13,774	869,269	1,841	15,115
New Grenada - - -	259,774	58	566,748	1,952	2,010
Peru, Bolivia - - - -	58,765,244	13,059	840,898	1,172	14,231
Brazil - - - - -	- -	- -	1,842,300	4,623	4,628
Chili - - - - -	1,040,184	251	250,142	862	1,098
Total - - -	122,050,724	27,122	2,940,977	10,026	37,148

Quantities of Gold and Silver supplied to the European Markets by the undermentioned Countries during three Centuries ending in 1848.

Countries.	Silver.		Gold.	
	Weight in Kilogrammes	Value in Millions of Francs.	Weight in Kilogramm s.	Value in Millions of Francs.
Europe, exclusive of Russia - - -	9,000,000	2,000	445,150	1,500
Russia - - - - - - - -	1,455,000	300	319,330	1,100
Africa, and the Islands of the Malay Archipelago, &c. - - - -	- -	- -	725,750	2,500
Totals - - - -	10,455,000	2,330	1,490,230	5,100

In the third volume of the London Mining Journal, p. 331, we have the following statement as to the produce of the precious metals: "In 40 years, from 1790 to 1830, Mexico produced 6,436,453 l. of gold, and 139,818,032 l. of silver. Chili, 2,768,488 l. of gold, and 1,822,924 l. of silver. Buenos Ayres, 4,024,895 l. of gold, and 27,182,673 l. of silver.

The following table shows the annual product (approximate calculation) in value of fine gold and silver for 1846 and 1850, the former being two years before, and the latter two years after the discovery of the gold mines of California.

—	1846.			1852.		
	GOLD.	SILVER.	TOTAL.	GOLD.	SILVER.	TOTAL.
	£.	£.	£.	£.	£.	£.
California . .	—	—	—	12,000,000	62,068	12,062,078
United States .	237,886	1,864	239,230	115,430	11,444	126,854
Mexico . .	249,758	8,457,020	8,706,778	882,901	5,888,888	5,766,284
New Grenada .	252,407	42,929	295,836	252,407	42,929	295,836
Peru . .	96,241	1,000,588	1,096,824	96,241	1,000,588	1,096,824
Bolivia . .	60,887	460,191	520,548	60,857	460,191	520,548
Chili . .	145,585	297,029	442,614	145,585	297,029	442,614
Brazil . .	259,871	2,008	261,874	289,068	2,227	291,295
Total of North & South America	1,201,560	5,261,619	6,568,179	13,841,989	7,259,824	20,601,813

Art. II.—REPORT ON THE MANASSAS MINING PROPERTY.

BY BENJAMIN SILLIMAN, JR.

New-York, *April* 18*th*, 1853.

To Joseph Cowdin, Esq.,

Sir:—In compliance with your request, I have visited the property of Thomas S. Hall, Esq., on the *Blue Ridge, at Manassas Gap, Fauquier Co., Va.;* have examined it in reference to the copper ores represented to be found there, and am now prepared to report to you:

1*st*. That the property in question does contain copper ore of good quality, of at least two varieties, and in apparently considerable quantities.

2*d*. That the number of veins showing copper, at present open, is three. Two of these are veins of *red oxyde of copper, with metallic copper*, cutting through *clay slates and compact graywacke rock*. The gangue or veinstone being a compact epidote rock, with quartz and asbestos.

The veins of red oxyde occur upon the lofty hill immediately in the rear of Mr. Hall's house, and at an elevation of some six hundred feet, probably, above the track of the railroad in the gap below. These two lodes intersect each other, as it appears according to present indications, at a point a few feet north of the

property of Mr. Hall and upon the adjoining estate of Dr. Taliaferro. One of them appears to run N. 30° E., and the other N. 70° E. These points have been ascertained by pits sunk at several places upon the two veins, on both the properties just named.

Near and just N. E. of the point of supposed intersection, is a trial shaft, now being sunk on the property of Dr. Taliaferro. This shaft has cut the vein marked I. upon the map (prepared by Capt. De Blessier, and now in the possession of Col. Adams), and has passed through it into the shales below; and it is expected that the other vein (marked II. upon the map,) will be cut at the depth of 55 feet. It appears from this exploration, that vein I. at the point *t* is about ten feet thick, perhaps twelve, and that it dips about 62 E., while the graywacke shales dip 85 or are nearly vertical. The vein II. is judged to be also ten or twelve feet thick, and has been opened at several points upon the surface, by pits sunk both upon the property of Mr. Hall, and also upon that of Dr. Taliaferro.

A pile of some eight tons (as I judged from simple inspection) of the red oxyde gangue, is now at the mouth of the pit, formed of blocks of ore whose average yield it would be safe to estimate at 20 per cent.

3*d.* It has never been my fortune before to see any thing like these beds of oxyde of copper. It is, as you know, a very valuable ore, yielding a larger percentage than any other ore of copper that is worked. Judging from specimens (of which I have seen many), it appears to me to be more like some of the *Siberian ores* than any others with which I am acquainted. The masses of native copper occur, implanted in a similar manner in the red oxyde, and both are accompanied by green *malachite* or *carbonate of copper.* The deposit of these ores at Manassas Gap is certainly a very interesting one, and offers every inducement for an active and thorough exploration and development. Fortunately the form of the ground upon Mr. Hall's property, renders the task of exploration an easy one, compared with that in most similar cases. The surface is cut by deep valleys, and rounded into lofty, wide sloping hills. One of these valleys makes up upon the right of the hill containing veins I. and II., and is so situated, that an *adit* level or *gallery* might be driven into the hill side some 200 feet below its summit; and, as nearly as I can judge, this adit would cut the veins of red oxyde in a distance of 800 or 1000 feet at the above-named level. This adit would, of course, drain itself, and it is believed that it would intersect one or more of the quartz lodes, carrying yellow copper at no great distance from its entrance. The opinion is founded on the fact that one of these veins (marked III. on the map,) as exposed on the railroad cut

now being made, makes up in the direction indicated by the dotted lines upon that map, and in the same general N. E. direction as that assigned to the two oxyde veins. Moreover, at a point in the bottom of said valley, vein-stone was discovered in place, carrying yellow copper minutely disseminated in it, and associated also with massive epidote. Several (say three) other quartz lodes, with yellow copper—branches perhaps of some larger one—are easily distinguished on the railroad cut. I am of opinion that still further developments of a similar character will be made very shortly in the progress of this cut, as I detected, on the occasion of my visit to the spot, where the laborers were then engaged in removing the clay and loose materials, the "back" or outcrop of a powerful quartz lode, making in the same direction as the others, but not, at the time I saw it, sufficiently opened to show its contents.

It seems, therefore, to me highly probable, that an adit level such as I have suggested above, would cut several of these quartz lodes carrying yellow copper, long before it was driven into the point where it would be likely to meet the veins of red oxyde of copper. Of course, should this prove to be the case, explorations could be carried on upon the course of such veins, to the right and left, without at all interfering with the progress of the main level toward the lodes of red copper.

4th. The quartz veins, as they are cut by the railroad, are hard and flinty on the outcrop, with the yellow copper sparsely scattered through them. They have, however, been cut so near their outcrop, and where the rocks around them have been very much upheaved and disturbed, that no fair inference of their metallurgic value can be at present drawn. Their value is, however, abundantly sufficient to warrant an immediate outlay to open and explore them. Such exploration can probably be made to advantage by an adit driven into the hill south of Mr. Hall's house, and upon the opposite side of the railroad track. Such an adit might be begun near the level of the water in the stream crossing the road, at some point most accessible, and in a line at right angles to the course of these lodes. Such a line would run nearly southeast, and would, as you will readily understand by reference to the map, be nearly one-third of a mile distant from the adit recommended to be driven for the red oxyde veins.

5th. Considering the facility of access to this property by the railroad leading to Alexandria, the thorough and easy drainage by adit levels due to the peculiar configuration of the country, and the very flattering prospect of an early return of the outlay in a rich and productive ore, I have no hesitation in giving as my opinion, that the property can be brought into a productive state at a far less expenditure than is usual in copper mining generally.

The region is healthy, well watered, near to fuel, and provided with a soil capable of sustaining a large population, and suited to the growth of all the cereal grains, and particularly adapted to grazing.

6th. It is, perhaps, worthy of remark, that copper ore of various sorts seems to be diffused to a remarkable extent through the rocks of this region, even where there are no appearances of a proper lode or vein. I observed variegated and vitreous sulphurets of copper disseminated in this manner through a bed of very hard and compact graywacke slate, upon the summit of the hill above Dr. Taliaferro's pit, and half a mile from it. This dissemination was so minute, that it would have escaped detection, except that the weather had turned the exposed surfaces green, from the decomposition of the ore. In the veins of red oxyde also, much of the epidote gangue, which has the peculiar yellow green color appropriate to that mineral, is observed under the glass to contain minute rounded globules of oxyde of copper and of metallic copper, and the weight of this gangue bears testimony to its containing a notable quantity of copper. This inference is sustained by Mr. Piggot's Analysis, Nos. II. and III., p. 7, of his Report upon this ore.

It is almost needless to add, that the present communication confirms in all material points, the Reports alluded to.

Yours, very respectfully,

B. SILLIMAN, Jr.

REPORT OF ANALYSIS.

New-York, *May* 18*th*, 1853.

Sir:—I present you, herewith, with two chemical analyses of the copper ores of the Manassas Gap mines. These ores were taken by myself from the mine, and the analyses have been made by Prof. John A. Porter, of the Analytical Laboratory in Yale College.

No. I. was a portion of the greenish epidote rock, showing no traces of copper, or of red oxyde of copper; and was chosen as representing the poorest part of the vein. It yielded of metallic copper 2.14 per cent.

No. II. was a portion of the red oxyde of copper separated from metallic copper, and was a fair specimen of this substance. It gave metallic copper 75.24.

No fair judgment of the value of the ore in question (or of any ore) can be formed from a hand specimen. An assay upon a sample of a large lot of dressed ore is requisite in order to obtain the percentage value. To make a rude guess, I should say that several tons of ore which I saw on the ground would yield from twenty to twenty-five per cent. of copper.

I have the honor to remain, your obedient servant,

B. SILLIMAN, Jr.

ART. III.—THE MINES AND MINERAL RESOURCES OF AMERICA.
NO. III.

W. J. TENNEY, ESQ.,—*Editor of the Mining Magazine.*

IN the conclusion of my remarks, in the article published in the August number of the Mining Magazine, I am accused of being severe; and it is urged that if my views are persisted in, they will embarrass and discourage persons who have but recently made their debut, as geologists, mineralogists, chemists and mining engineers. Of any such design I am wholly unconscious; and I forever disclaim any intention to embarrass or discourage the student of Geology, wherever the mining interests of the country may not be embarrassed, or their developments delayed, by the premature interference of men, whose practical experience has not qualified them for the arduous and intricate duties appertaining to the development of the mineral resources of the United States. To this end every other consideration must give place. And to secure this object, I would propose that a Board of Examiners be appointed by the State Government, to consist of Professors Silliman, Henry, Dana, Jackson, Hayes, or gentlemen of equal knowledge, to examine, annually, all who aspire to a position as geologists, mineralogists, chemists, and mining engineers. Having passed the ordeal of an examination and received the certificate of the Board of Examiners, let them obtain a reputation by proving themselves competent by managing the business of their respective pursuits, with credit to their profession and profit to those who have invested capital upon the authority of their judgment. Also let the Board of Examiners, under the authority of the State, select from their number one whose duty it shall be to assay all ores, and determine the percentage of metal they contain; and let his certificate be evidence in all courts of justice, and on change, as between the seller and the purchaser of ores. In order that he may be disinterested let him receive a salary to be paid by the State. Let the officer be styled "The Assayer General of the State of New York." The adoption of the above suggestions, or a similar plan, would put at rest all questions, and place the mining interest of the country upon a solid foundation. Again I am reminded that I have departed from what the title of this article indicates,—"the mining resources of the United States." I proposed in my last paper to continue the mineral resources of New York, but have concluded to defer the same for a future number and pass on to "the State of New Jersey."

NEW JERSEY.

I shall first notice the Iron Mines which are similar to those of Putnam County. Iron is found in great abundance in the Primi-

tive Mountains in the vicinity of the Delaware River. It occurs also at Sparta and Hamburgh, and east of Newton in Sussex County, also at Schooley's Mountain in Morris County. Magnetic oxide of iron is found a few feet to the west of the Franklinite bed of "Red Zinc Ore" at Sterling. This ore of late, has attracted considerable attention, as an ore for iron and steel; but so far as the writer has been able to discover, it possesses no advantages over many of the oxides of iron—found abundantly all over the country. The fineness and tenacity of the specimens which have been exhibited, are the results of the labor bestowed in the manufacture. It is also evident that ores do not derive benefit by being amalgamated with zinc.

Granular argillacious iron occurs in the southern part of the State in large quantities in clay. The iron mines at Andover, are probably the most valuable for iron in the State, and are extensively wrought by Messrs. Cooper and Hewett. They were once famous for producing the best iron in America. Argilaceous oxide of iron occurs near Burlington, also hematitic brown oxide of iron in large quantities, and highly valuable as an ore. Micaceous oxide of iron occurs at Fort Lee. Chromate of iron is found in several places in the State. Earthy Phosphate of iron exists in Monmouth County. An extensive mine of sulphurret of iron exists near Green Pond, where copperas was formerly manufactured. Argilaceous oxide of iron occurs at Nevisink Hills, and micaceous oxide of iron on Snake Hill, near the Hackensack River. As iron ores are very abundant in the State of New Jersey, and very uniform in character containing less foreign substances than the ores of Pennsylvania, and as many of the veins lay in the immediate vicinity of railroads or canals which penetrate the great coal basin of Pennsylvania, it is not unreasonable to suppose that they are of great value and will soon be made productive.

The red zinc ore, of New Jersey, is next in importance to the iron ore.

This ore assumes a micaceous form, and, in many instances, is coated with the white oxide in combination with iron. Franklinite forms a bed or vein near the zinc which appears to be a solid mass, (I speak from recollection) of thirty or forty feet in thickness. Silicious oxide of zinc, calamine and sulphuret of zinc occurs in many places in the State, but the principal, and probably the only important mines of that metal belong to an association of gentlemen, who have disposed of a portion of their preperty to the New Jersey zinc company.

Copper Mines.—Sulphuret of copper, and oxide and carbonate of copper, and malachite of copper in small quantities occur at Boundbrook; gray sulphuret and green carbonate of copper

are found near Franklin;—carbonate near Paterson and at Pluckamin; also at the Schuyler mines on the Passaic river, near Newark, which were once productive under the management of Mr. Schuyler, the proprietor. The ores consist of grey sulphuret, native copper, red oxide, green carbonate, blue carbonate, and fibrous malachite in emerald green groups of chrystalline fibres, diverging from a point, or in tufts of short fibres resembling green velvet. This is sometimes associated with yellow sulphuret of coppcer and carbonate of lime; or occurs in the form of compact malachite in mamillary concretions. It is also sometimes accompanied by red oxide of copper, remarkable for the quantity of dog-tooth spar, which everywhere fills the vein. The Somerville mines at one time attracted the attention of capitalists and men of science. Copper ores of various kinds were found underlying a large district of country, and consisting of native copper, red oxide, green carbonate, phosphate, silicious, hydrate, ferruginous, malachite, and blue copper ores and native silver. The same also occurred at Woodbridge in many instances. I have an impression that with the knowledge of the present day on the treatment of copper ores, the works in that section would have been continued, and possibly have been remunerative. But the experience of the past has cost so much, it is doubtful if the works will be renewed during this generation.

Phosphate of Lime.—Phosphate of lime occurs at many of the primitive iron mines, and at Allentown the earthy phosphate of iron. Earthy marl with organic remains is abundant in Monmouth and other counties in the State.

Peat also occurs in several localities. From one near Newark Bay it was used for fuel for twenty years. Perhaps the most important one is at Pompton Plains. It contains more than 1,500 acres. There is another location containing 500 acres, where it rests on marl, near Union.

This State also abounds in clays and kaolin of good quality, and in large quantities. The former are used for fine and common brick; and large quantities of the latter are consumed by paper stainers and alum manufacturers. The principal consumers are the Roxbury Chemical Works, near Boston. The best article is found near Woodbury, in the vicinity of Perth Amboy.

Coal.—This mineral has been sought for in the State for the last century. As early as 1750, a company was formed in the city of New York to mine coal near Patterson. Although coal is found in small quantities in many places in New Jersey, yet, gentlemen of science have long since abandoned the hope of finding it in workable quantities.

Precious Stones.—Amber occurs near the Delaware in de-

tached pieces, some weighing one pound. It is found yellow and transparent at Camden. Beryl amranthus, jasper, amethyst, agate, garnet, also are found.

New Jersey abounds in graphite, serpantine, mountain leather, and a variety of useful and beautiful stones, suitable for building materials. The most conspicuous of these are the cement quarries, near Newark, where large quantities of hydraulic cement is annually manufactured; and the Newark and Little Falls freestone quarries. This stone, from the latter quarry surpasses in closeness of texture and beauty of formation any material of the kind offered in the market of the United States. Trinity Church is, and will remain for ages a proud monument of its beauty and perfection.

(To be continued.)

ART. IV.—ANALYSIS OF SOILS.—By Andrew Ure, M. D., A. R. S. with Remarks on Agricultural Geology.—By Prof. Charles Stearns.

Having been some time ago engaged in a minute chemical examination of the soil of a large farm, remarkable for perennial fertility without manure,* I have been led to adopt some simplified methods of analysis, which may to a certain extent be practised by ordinary farmers, and may throw some light on the means of improving permanently the composition of their lands. The field from which the sample subject of analysis was taken, is situated on Marsh Farm, in Haveling level, in the parish of Hornchurch, Essex, not far from the banks of the Thames, and nearly opposite to Erith. R. M. Kerrison, Esq., M. D., F. R. S., the proprietor, informs me that no manure has ever been applied to this farm of 200 acres, during a period of at least fifty years, except once; and in that season the wheat became so heavy as to be in a great measure spoiled. It produces every variety of crop most abundantly.

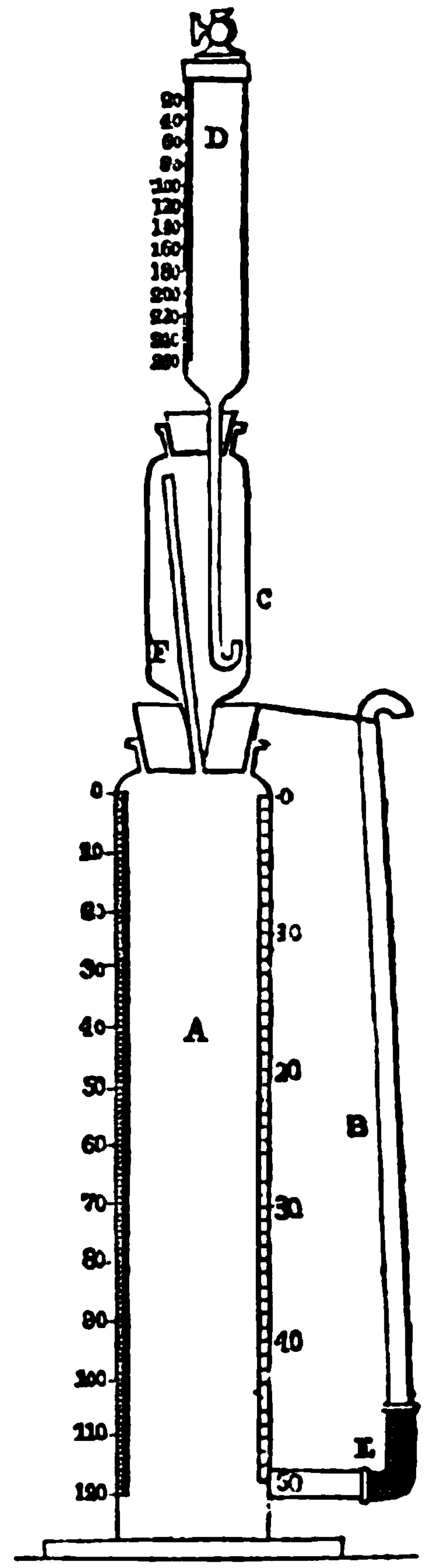
The substratum, which lies beneath a three-feet bed of the the soil, is an alluvial deposit, replete with decaying vegetable matter; the remains probably of some ancient forest, which existed prior to the formation of the Daggenham Breach, through which the river had inundated a large district of country, and kept it submerged till about two centuries ago; when it was stopped out by the aid of a parliamentary grant, administered under the direction of a skilful engineer. The soil over the whole farm is of very uniform texture and appearance; being a finely comminuted friable loam, quite free from stones, consisting of a fortunate mixture of fine silicious sand, clay, oxide of iron, and

* All the stable-yard dung is sold by the farmer.

carbonate of lime, with minute proportions of phosphate of lime and magnesia, but very little organic matter. It would seem, therefore, to derive its principles of fertility chiefly from the atmosphere, and the emanations from the subsoil.

The specific gravity of the soil, in its average state of dryness, is 2·2 to water called 1·0; indicating the presence of but little vegetable matter.

100 parts of it collected after a period of ordinary dry weather lose 11.2 by a steam heat of 212°, and readily reabsorb that portion of moisture when again exposed to damp air. When the dried residuum is calcined at a dull red heat, six parts of vegetable substance are burned away; at a higher temperature the carbonate of lime would become calcined, and cause an additional loss of weight, which might inconsiderately be mistaken for organic matter.



The first problem in an agricultural analysis, is to find the proportion of calcereous matter, as carbonate and phosphate of lime. This may be easily solved with the aid of the following instrument (see cut), which may be called the *Limestone Meter*, one of which was presented and explained by me to the Council of the Royal Society of Agriculture on the 29th of May, 1848.

A, is a cylinder of glass, two inches in diameter, and fourteen inches long, graduated on one side with a scale, into spaces of 100 water-grain measures from 0 to 12,000, marked 10, 20, 30, &c.; and graduated on the other side into spaces of 240 water-grain measures each. The former scale is used for the analysis of all sorts of alkaline carbonates, and also of acids; the latter is adapted to the direct analysis of carbonate of lime and marls; and indirectly to that of phosphate of lime and carbonate of magnesia.

The cylinder A has a tubulure in its side near the bottom;

this is closed with a cork, in the axis of which a short glass tube is cemented, hooped externally to a collar of caoutchouc E, which serves as a joint to the upright long glass tube B, held near its upper recurved end in a hooked wire.

The top of the cylinder A is closed with an elastic cork, through a perforation in which the taper tail of the little phial C passes air-tight. The small tube F, open at both its ends, is cemented on its outer surface, into the bottom of the phial C, so as to close it, while the tube itself opens a free passage to gas, from the shoulder of the phial down into the cylinder A.

The mouth of the phial C is shut with a cork, through which the small end of the tube D passes air-tight. The tube D is graduated into spaces of 10, 20, &c. water-grain measures up to 250, and is closed at top with a stopcock. Its lower and capillary extremity is recurved.

In ascertaining with this instrument the proportion of real carbonate of lime, in any limestone, marl, or soil, proceed as follows :—

Lift out the phial C, and pour the water into the cylinder A till it stands about half an inch below the line marked O, and fill up this space with common linseed-oil. Restore the phial C to its place, pressing it in air-tight. Then take out its cork with its graduated tube, and introduce into the phial as many grains weight of the soil or marl as it is proper to operate upon. Of an average limestone 50 grains are sufficient, because the magnified scale of the *lime-proof* is adapted to the analysis of 50 grains of pure carbonate of lime. Of soils and marls, 100, 200, or even 500 grains, may be taken, because these substances will rarely contain one-tenth their weight of carbonate of lime. But as the result may always be obtained within five minutes, at the cost of half a farthing, several successive experiments may be made on different weights of the sample. Having introduced the proper weight of the object into the phial, cover it with water, till this stands a little above the point to which the recurved tube descends. Holding D in the hand, dip its bent point into a phial containing ordinary muriatic (hydrocloric) acid, diluted with its own bulk of water, and applying the mouth to the open stop-cock, suck up the acid into the tube till this be about two-thirds full, then turn the key of the cock before it is taken from the lips, and the acid will not drop out when the tube is held upright. Replace the cork with its tube D in the phial C. Detach the long tube, B, from its wire-rest with the left hand, and hold its curved extremity above an empty basin ; then with the right hand open the stop-cock of D, to let a little acid run down upon the marl, but shut it almost instantly again, lest too much acid should escape, and cause so brisk an effervescence as to occasion an overflow of

the mixture into the small tube F. The disengaged carbonic acid escapes through the tube F, presses on the surface of the oil in A, and causes a stream of water to flow from the tube B, into the subjacent basin. When the water ceases to run, open the stopcock again, when more acid will descend, cause a fresh extrication of gas, and a further flow of water. The curved end of the tube B should be progressively lowered, as the oil falls in A, so as to maintain its level and that in the tube, in the same horizontal plane. Whenever gas ceases to be extricated by the muriatic acid, the experiment is completed, and the number on the *lime-meter* scale opposite to the upper surface of the oil, denotes the number of grains of carbonate of lime, in the quantity of lime-stone, marl or soil, put into the phial C for experiment. A little carbonic acid gas remains condensed in the muriatic solution, but this is not more than equivalent to the bulk of liquid acid introduced into the capacity of the apparatus; so that no compensation need be made on this account. For the purpose of minute chemical research, that portion of gas may be expelled by surrounding the phial C with a cloth rung out of hot water, and the volume of dilute acid added may also be taken into the account. Thus the composition of carbonates by an acid, and of acids by a bi-carbonate, may be determined by means of this instrument with equal rapidity and precision.

The contents of the phial may be poured out into a porcelain capsule, gently heated, and thrown on a filter. The lime of the carbonate, as well as the phosphate of lime and the magnesia, will pass through in solution along with a very little iron. On super-saturating the acidulous liquor with water of pure ammonia, phosphate of lime (if present) will fall, and may be drained on a filter and dried. Taken off the dried filter, and digested with a little dilute sulphuric acid, sulphate of lime will result, characterized by its entire insolubility in dilute alcohol. Hence the sulphate washed with vinous spirits, dried and calcined, will represent by its weight one-fifth more than its original weight of the phosphate. By the action of the sulphuric acid, the iron precipitated by the ammonia with the phosphate is got rid of.

The magnesia, unless its proportion has been very great, will all remain dissolved as ammonia-muriate, and its quantity may be ascertained by precipitating it either with soda, or phosphate of soda. In the former case, the substance obtained, when washed on a filter, dried and ignited, is pure magnesia; in the latter, it is the ammonia-phosphate of magnesia: and when dried at the moderate heat of 12° Fahr., it represents by its weight about six times that of the magnesia present; or for 100 parts 16⅓ of magnesia

When a complete analysis of soil is to be made the following apparatus is convenient:—

A large glass flask, or matrass, with a sucked in or concave thin bottom. This should hold at least a quart of water; and when the soil and dilute acid are introduced, it is to be placed on a stand over the gentle flame of a spirit lamp, while the beak of a large glass funnel, having its mouth covered with a porcelain basin, filled with cold water, is inserted into the neck of the flask. By this arrangement a continual ebullition may be maintained in the mixture of soil and acid, without loss of acid, or nuisance from its fumes, because its vapors are condenced whenever they reach the cold basin above the funnel, and a perpetual cohobation takes place. A boiling heat may be kept up in this way till every constituent of the soil, except the silica, becomes dissolved. Muriatic acid is generally preferred for the analysis of soils, and in somewhat greater quantity than the bases in the given weight of soil can neutralize. The funnel and porcelain basin should be properly supported upon the rings of a chemical stand. I generally subject 100 grains of soil to the action of boiling dilute acid in this way for 6 or 8 hours; at the end of that period I throw the contents of the matrass upon a filter, and supersaturate the filtered liquid with ammonia. The silica which remains on the filter having been washed in the process, is dried, ignited, and weighed.

The alumina, iron-oxide, and phosphate of lime, thrown down by the ammonia being washed in the filter, and dried to a cheesy consistence, are removed with a bone or tortoise shell blade into a silver basin, and digested with heat in a solution of pure potash, whereby the alumina is dissolved, when its alkaline solution is to be passed through a filter, then saturated with muriatic acid, and next supersaturated with ammonia. Pure white alumina falls, which is to be separated on a filter, washed, dried, ignited, and weighed.

The iron and phosphate of lime on the alkaline filter may be dried, gently ignited, and weighed, or otherwise directly separated from each other without that step, by the action of dilute alcohol, acidulated with sulphurie acid, at a gentle heat. Thus the iron oxide will be dissolved, and its solution may be passed through a filter, while the sulphate of lime will remain upon it, to be dried, ignited, and weighed. Five parts of it correspond to four of phosphate. The iron is obtained by precipitation with water of ammonia, filtration, and ignition.—

The first filtered liquor, with excess of ammonia, contains the lime of the carbonate, and the magnesia. The former is separated by a solution of oxalate of ammonia, with digestion in a moderate warmth for a few hours, filtration, and very gentle ignition of the washed dry powder, when the pure carbonate of lime is obtained. The magnesia, existing in the filtered liquor

as an ammonia-muriate, may be obtained by precipitation with soda, or phosphate of soda, as already described.

For some refractory soils, in which the alumina exists as a double or triple silicate, it becomes necessary to fuse 50 grains of the sample, in fine powder, mixed with four times its weight of dry carbonate of soda, the mixture being put into a platinum crucible, and into a cavity in its centre, 50 grains of hydrate of potash being laid.

The crucible being slowly raised to a red-white heat, affords a fused liquid quite homogeneous, of a gray or brown colour according to the metals present in it. Manganese gives a purple tint; and iron a reddish brown. The fused matter should be poured out into a shallow platinum basin; and, whenever it cools, it should be pulverized, dissolved in dilute muriatic acid, the solution evaporated to dryness, the dry mass again digested in hot water, acidulated with muriatic acid, and the whole thrown upon a filter. Pure silica will remain on the filter, to be washed, dried, ignited, and weighed.

The filtered liquor contains the remaining constituents of the soil, as it is to be treated as already described.

Besides these systematic investigations, researches may be made for certain peculiar substances, and especially the neutro-saline constituents. In this view 100 grains of the soil may be triturated with 20 times their weight of distilled water, placed in a beaker, till the clayey matter subsides, and the clear portion may then be decanted into a filter. A little of the filtered liquor should be tested with nitrate of barytes, and also with oxalate of ammonia; and if such portion yields a precipitate, they show the presence of sulphate of lime; and the following steps ought to be taken to eliminate it entirely; 200 grains of the soil should be triturated with a quart of distilled water, holding 50 grains of sal-ammoniac in solution. The mixture should be allowed to clarify itself by subsidence, when the supernatant clear liquor is to be filtered, and evaporated down to 2 ounce measures, and then mixed with that bulk of strong whiskey (11 per cent over-proof). The whole sulphate of lime will be now separated from the fluid, and after being drained on a filter, may be dried, ignited, and weighed.

For determining the alkaline salts, the water filtered from the 100 grains of the soil should be evaporated down to one-fifth of its bulk, and then treated—1st, with nitrate of barytes, for the sulphates; 2d, with nitrate of silver for the muriates; 3d, with oxalate of ammonia, for the nitrate or muriate of lime (provided no sulphate of lime is indicated by the first test); 4th, with litmus paper, for alkaline or acid reaction; 5th, with soda-chloride of platinum for potash salts, which are very valuable for the growth of many plants.

The portion of soil tested for potash salts should, before being digested in water, be gently calcined, to insure the expulsion of every particle of ammoniacal salt, otherwise the precipitate afforded by soda-chloride of platinum would be fallacious.

Another peculiar research of great importance is that which determines the amount of ammonia in a soil; and which may exist either ready formed, or in its elements, capable of affording a portion of the azotic food so indispensable to vigorous vegetation. The actual ammonia is easily obtained by distilling the soil along with some milk of lime. The distilled water will contain all the volatile alkali, which may be measured by the number of drops of a standard dilute acid which it will saturate.

The *potential* ammonia, slumbering, so to speak, in its embryo elements, may be estimated by igniting 200 grains of the soil with its own weight of a mixture of hydrate of soda and quicklime, as described in my memoir on "Guano," in this work.

I have subjected the soil of Dr. Kerrison's farm to the various modes of research above enumerated, and have obtained the following results:—

1. By the application of my *limestone meter* I obtained carbonic acid gas, equivalent to 9 grains of carbonate of lime.

2. By igniting 200 grains of the soil along with 200 grains of mixed quicklime and hydrate of soda, in the appropriate apparatus, I obtained 0·34 grains of ammonia, or 0·17 per cent. of the weight of the soil. Hence, 600 grains of the soil contain the azotic equivalent of one grain of ammonia. This remarkable fact reveals most plainly one secret source of the uninterrupted production of rich crops of cereals and other plants from it, without receiving any manure. How appropriate to such land is Virgil's beautiful title of the subject of his "Georgics," *justissima tellus!*

3. By the process of cohobation for 8 hours, with dilute muric acid, as also by the process of fusion with the alkalis in a platinum crucible, and the subsequent treatment above detailed, I obtained—

1. Silica - - - -	56·0
2. Alumina - - - -	8·0
3. Oxide of iron - . - -	5·5
4. Carbonate of lime - -	9·0
5. Sub-phosphate of lime - -	0·4
6. Magnesia (carbonate) - -	0·5
7. Moisture separable by steam-heat	11·3
8. Organic matter, chiefly vegetable mould	6·6
9. Moisture separable at a red-heat	2·7
	100·0

besides traces of muriate of soda, and muriate of lime (chlorides of sodium and calcium). The iron exists mostly in the state of protoxide, a circumstance owing, probably to exhalations from the subsoil of sulphuretted, phosphuretted, and carburretted hydrogen. The fresh soil is of a grey colour, but become ochrey-red by calcination.

100 grains of the said soil, dried at 212° absorb 8 grains of moisture in 24 hours; while 100 grains of the comparatively sterile soil of Regent's Park, dried equally, absorb only 5 grains; a difference due chiefly to the finer comminution of the former.

Since the phosphates are such precious ingredients towards fertilizing soils, it is desirable to possess a clear and simple test of their presence. For this purpose digest the soil, for an hour or so, with a moderate heat, in dilute nitric acid, free from muriatic (viz. which affords, when largely diluted, no precipitate, by the addition of a solution of nitrate of silver). Throw the mixture on a filter, and to the filtered liquid; add potash-water, cautiously, till the instant that a precipitate begins to appear; then drop into it a weak solution of nitrate of silver. If any phosphoric salts be present, a yellowish precipitate will immediately fall, which is re-soluble in an excess of nitric acid. Whatever is not thus dissolved is chloride of silver, and ought to be separated by filtration. On adding then weak water of potash (not ammonia) cautiously to the filtered liquid, the pure phosphate of silver will be obtained, without any alumina or iron, provided the liquid be still acidulous in a slight degree. It ought to be remembered that chloride of silver falls in a *white* curdy form, quite different from that of the phosphate of silver. The portion of soil used for this experiment should be fresh and not calcined, because the *phosphates*, when ignited, afford white precipitates with salts of silver. The stronger the solution of the phosphoric saline compound is, the more characteristic is the yellow precipitate with silver; and then ammonia may be used for effecting the partial saturation of the acid excess. Sulphate of magnesia is an excellent re-agent for detecting phosphoric acid, and for separating it from the above acid solution, when it is partially neutralized with ammonia; for the magnesia forms, with the phosphoric acid and ammonia, the insoluble granular precipitate of ammonia-magnesian phosphate. A solution of sulphate of magnesia, containing a little sal-ammoniac, is probably the best test-liquor for detecting phosphates in faintly acidulous, but still better in neutral solutions.

In almost all soils of an arable nature under cultivation in this country, there is a sufficiency of calcareous matter present to counteract the combination of phosphoric acid with alumina or oxide of iron, for which reason it would be an idle refinement

of agricultural analysis to search for phosphates of alumina and iron. As for manganese, often associated with iron, it exists in too a small a proportion, and is possessed of too little value, to make it worth while to effect its separation. It gives to calcined iron-oxide a black hue, and is characterised in its saline solutions by the flesh-coloured precipitate which it affords with hydro-sulphuret of ammonia, after the whole of the iron has been thrown down by boiling the solution of the two metals with pure carbonate of lime.

The organic matter in any soil may be correctly estimated by calcining its powder pretty strongly till the carbonic acid be expelled from the lime in it. The loss of weight, deducting that due to the carbonic acid gas (which is known from an independent experiment), gives the quantity of organic matter. Its quality is determined by the ultimate analysis by means of hydrate of soda and quicklime, as previously stated.

The phosporic acid may be also estimated by digesting the ignited soil in nitric acid, precipitating the filtered solution with acetate of lead in excess. If phosphoric acid be present it will produce phosphate of lead, mixed with a sulphate, if any sulphuric acid existed in the soil. Wash, ignite, and weigh the precipitate. Digest in nitric acid, decompose the solution with sulphuric acid, and alcohol, throw the mixture upon a filter, and weigh the sulphate of lead remaining left upon it. From this weight, that of the oxide of lead becomes known; since 152 of sulphate of lead contain 112 of oxide. The quantity of sulphuric acid found by nitrate of barytes in another equal portion of the soil, being added to the oxide of lead just determined, will constitute a sum, which, being substracted from the weight of the acetate of lead precipitate, will represent the amount of phosphoric acid in the soil.

In the very eleborate analyses of the ashes of different kinds of wheat, by Fresenius and Will in Germany, Bichon in Holland, Boussingault in France, and others, one half of the whole was found to be phosphoric acid.

In the preceding method of analysis the detection of potash is made directly by means of the soda-chloride of platinum. The following process is adapted to determine the quantity of that important alkali, as well as of soda. The solution of the soil in hydrochloric acid is to be treated with barytes water till the liquid blues reddened litmus paper; it is then heated and thrown upon a filter. By this means the whole of the sulphuric and phosphoric acids, as also of the oxide of iron, the magnesia, and the lime that was combined with the phosphoric acid, is separated. The precipitate is to be washed till the water which passes ceases to be affected by nitrate of silver. To the clear

liquor, gently heated, carbonate of ammonia mixed with caustic ammonia is to be added, to throw down all the barytes. The whole is to be left in repose for a little till a granular precipitate falls, and it is then to be thrown upon a filter and washed. The filtered liquor being evaporated to dryness, the residuum is to be ignited in a platinum or silver capsule, to expel all the ammonia, when it can contain only the alkaline metals, potassium and sodium, in the state of chlorides. After being weighed, it is to be dissolved in a very little water, when a trace of magnesia may appear (which can be eliminated and weighed); and the amount of potash is to be estimated from the weight of the precipitate produced by soda-chloride of platinum. The difference of the weight of the whole chloride and of that corresponding to the potash just found gives the quantity of sodium chloride, and of course of soda, in the soil.

AGRICULTURAL GEOLOGY.

Sir Humphrey Davy seems to have lost sight of the fact, that it was mainly due to his knowledge of Geology that he was enabled to make so many discoveries, which have been adopted by the agriculturist. But this arises, undoubtedly from his preference for the science of chemistry. Geology, nevertheless bears the same relation to Agriculture as Religion does to morality, or the Constitution to a fixed form of Government.

It has been, and even is, at the present day, believed by some that the lofty mountains, with their deep chasms, and the rough and distorted portion of the earth's surface, furnish evidences of man's disobedience, and the Creator's displeasure; and that he in his wrath destroyed the beautiful symmetry of the earth's surface. No doubt can be entertained, but this theory is erroneous. On the contrary, the rough and mountainous portions of the earth, when properly understood, furnish a most instructive lesson to mankind; and one fraught with deep interest to the chemist and student. Here, the man of science beholds the great chemical laboratory of the Creator. Here, he discovers the design to make the earth fruitful and productive, and the assurrance to mankind, that if they sow in faith they shall reap an abundant harvest. Here, also, the geologist discovers lime, gypsum, phosphric, sulphuric, fluoric, and all the acids necessary to invigorate, and prepare the soil in the valleys below for an abundant harvest; and likewise beholds chemical agents adapted to absorb the ammonia of vegetable and putrescent manures.

The man of science witnesses with satisfaction the vapors around the mountain—gathering their force upon its lofty summit, and he understands that the chemical laws are in full operation

under the special care of creative power, for the benefit of man; and as the clouds burst in terrific force upon its rugged sides, and swell the current of some sluggish stream, detaching here and there huge rocks, and precipitating them into the chasms below; or lodging them where the frost of winter, the rains of spring, and the heat of summer, all contribute to dissolve them, and the subsequent storms of rain, by piecemeal deposit them on the plains below to enter into a new combination, and to become the renovating and life-giving element of vegetation. So, copying from these great first principles, men have sought to imitate them, and in no instance have they arrived at a more correct conclusion than in the preceding article from the pen of Dr. Andrew Ure.

By those who have perused the suggestions in the "Analysis of Soils," it will be readily understood how necessary it is that the student of agriculture should regard geology as the basis of all his knowledge, that thereby he may distinguish the fertilizing ingredients which lay strewn broadcast upon the earth's surface. In some districts lime occurs, in others gypsum, phosphate of lime, marl, clay, and many other substances, which, by the aid of chemistry, he at once renders available. With knowledge added to labor he reclaims the marshy and low grounds, and makes the barren, silicious sand verdant with fields of grain, and renders happy and comfortable the less favored portions of the human family.

How different must be the reflections of the successful student of science to those of military men, whose pathway through life has been wet with blood. The man of science feels, that in all future time his works will be identified with the happiness of mankind, that his victories are bloodless, and that the wreath which encircles his brow shall for ever blossom—deriving its sustenance from the grateful remembrance of his fellow-men.

CHARLES STEARNS, *Geologist.*

ART. V.—SHELBURNE LEAD MINES.—REPORT OF DR. CHARLES JACKSON.

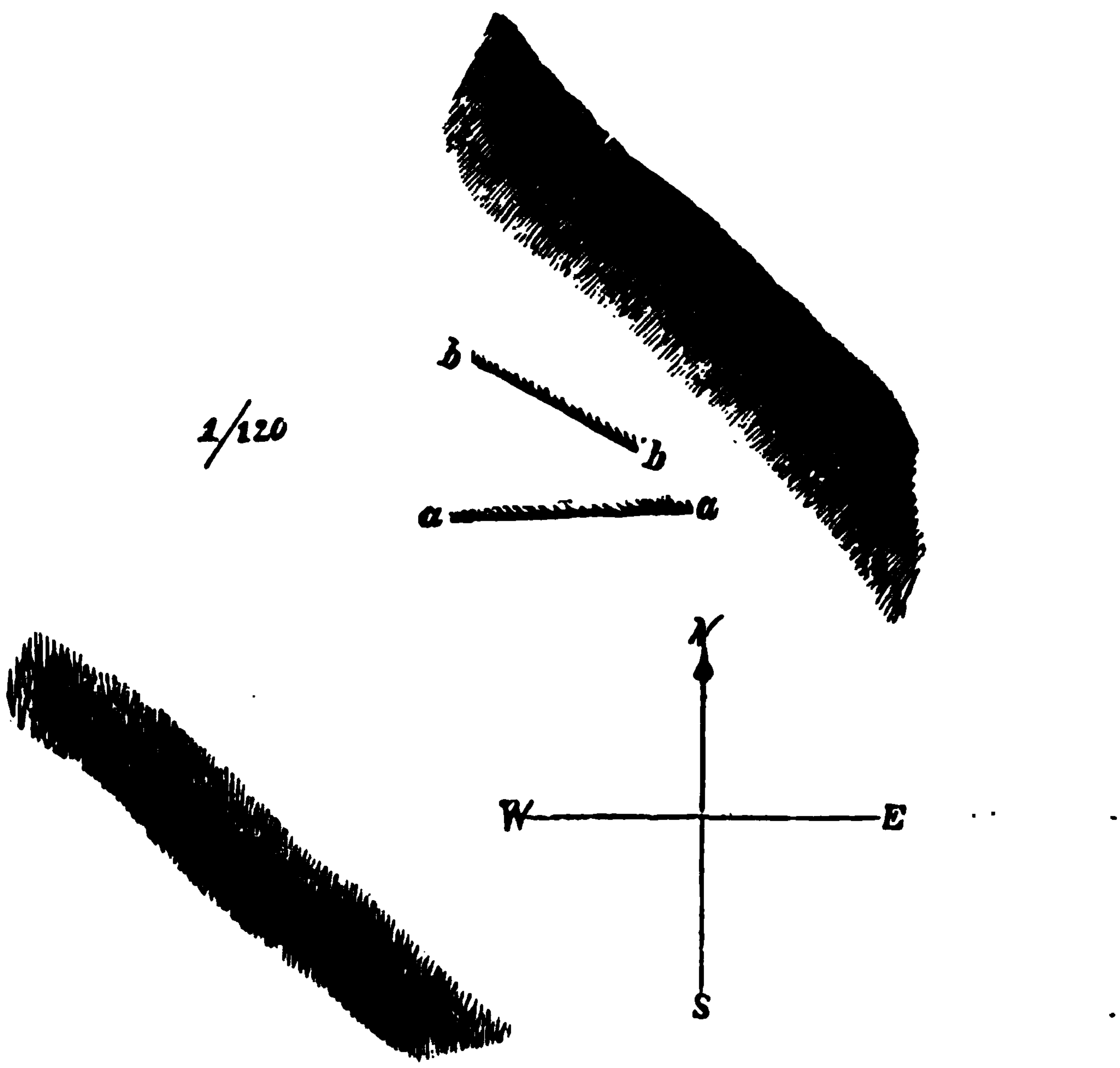
GENTLEMEN:—At your request I visited the Lead Mine in Shelburne, and by the aid of your miners, was enabled to obtain more full information respecting the workable value of the lead-veins. As we had an opportunity of inspecting the ores which they raised, and of observing how much ore they could extract in a given number of hours, it was easy to form an approximate estimate of the quantity a gang of regular miners could raise per day. By assaying the ore in fair samples, its value is easily

learned; so that we can decide the question as to the value of the mine and its productiveness.

A pretty full description of this mine is contained in my final report on the Geology and Mineralogy of the State of New Hampshire (pp. 102, 103, and 228), insomuch that it will not be necessary for me to enter into a very detailed account of the geographical character of the country, or to describe all the minerals which occur there. I shall therefore limit myself in the Report, to a very brief statement of the situation of the mine, and the minerals which occur in the veins; while a more full account of its economical value will be given, and the method of working it will be detailed.

Shelburne Lead Mine is situated in a northwest part of the town, in a gorge, two miles northwest from the house of Mr. Burbank, and in the bed of a small stream, which comes down from the mountains and runs through the gorge.

The veins are included in compact mica slate rocks, and are quite irregular in their dimensions, and in their course through the rock. They are what miners call pipe veins, and have very



rich branches of pure ore at different points in their course. The general direction of the lead veins is N. 80° W., S. 80° E., and they dip to the northward about 70° from the horizon. There is, however, such a diversity of directions and dips of these veins,

that they often cross each other, and evidently must unite in several places below the surface. Hence, it is practicable to work two or more veins at the crossings, where the bunches of ore are much heavier or more frequent. One of the veins runs N. 86° E., S. 86° W., and dips to the N. 75°. Another near it runs N. 56° W., S. 56° E., and dips to the N. E. 86°.

The first vein is from 3½ to 8½ inches in width, and the second is 4 inches.

The distance apart is 5 feet 3 inches. Now it is obvious that these two veins will meet each other in two places, one meeting at the junction of the lines of directions, and the other with that of their inclination or dip.

There are about half a dozen veins in the ravine within the limits of 36 feet. Some of those which I surveyed while employed by the State, were covered with gravel and water, during our recent visit; and some of those now uncovered and wrought, are new ones. On the northern side of the ravine is a singular variety of galena, being fibrous in its structure, and very compact. It resembles somewhat the sulphuret of antimony, but is really an argentiferous sulphuret of lead.

The width of the veins varies so much in different parts of the course, that it is impossible to give an accurate measurement; but it might be stated generally, that they are from ½ an inch, to 8½ inches wide, and that the black blende, or zinc ore, occurs mostly in the pipe veins and not in the branches, which occur in their course at frequent intervals, as represented in the woodcut in my final report on the Geology of New Hampshire, p. 103, which cut is a drawing of the veins on the south side of the ravine. Iron pyrites is scattered through the lead veins in crystals and in groups, filling cavities. Brown spar is the vein-stone or matrix of the lead ore. Copper pyrites occur occasionally, associated with the black blende or zinc ore. It appears that the black sulphuret of copper is the coloring matter of the black blende; as a notable proportion of copper has been found in it by analysis. It is probable that your company will limit its operations to the extraction of argentiferous lead, and, therefore, it will be unnecessary for me to enter into any details concerning the manufacture of the zinc. Your smelting works will be erected near the mine, and the ore will be reduced to pig lead, and sent to market in that state, or you will take it to some convenient place for cupellation, so as to separate the silver from the lead.

With regard to the practicability of working the mine, I would observe that it can be done with a reasonable expense in preparation. A dam must be constructed at the head of the falls, and a wooden trunk or aqueduct is to be placed so as to carry the water one side, or over the head of the miners who may work the veins in the ravine. This method has been

adopted in one mine at my suggestion, and works very well. It is the cheapest you can follow, and will afford you the opportunity of using the water from the aqueduct in washing the ores. The distance from the top of the falls to beyond the mine, is 105 feet, and the slope is 7° 20. It is evident that the water may be run off in a very swift current, so that it cannot freeze or accumulate. The present width of the stream is from 1½ to 2 feet, and its depth 2 inches; but in the freshets this little stream becomes swollen into a powerful torrent, and fills the ravine to some depth, probably three or four feet. Therefore it will be needful to make the aqueduct a trunk of stout plank, and to have it well secured. Below the mine about 20 or 30 rods, the stream unites with a branch coming in on the west side of the hill, and thus it is of sufficient power to move all the machinery required in working the ore. I placed a level log on the bottom and secured it tight, and then gauged the water and found it to be 2 inches in depth, on a dam or capling of 3½ feet in length. Look in the tables of discharge of water, and you will find the quantity discharged by this stream.

In order to form some approximate estimate of the quantity of ore a miner could raise per day, we employed two men in blasting out ore on one of the veins, noting the time when they commenced operations, and when they finished. The ore was weighed, and thus from 9 A. M. to 12, noon (three hours), two men raised 160 pounds of fifty per cent. lead ore, which would be equal to 1,280 pounds in twenty-four hours. One half of this weight being lead, it would amount to 640 pounds, which would be worth for lead at three cents per pound, $19 20; and if the lead contains five pounds of silver per ton, 640 pounds will contain $1\frac{6}{10}$ pounds, which will be worth $30. Hence, the metals raised by two men in 24 hours, will be worth $49 00. The expense of smelting the lead and separating the silver, must be deducted from this; but I have no data applicable to the kind of works you are about to erect—the cost will be comparatively little.

In this experimental trial it should be observed that only one vein was worked upon, and that the miners had to work at a disadvantage; there having been no systematic efforts made, as in regular mining operations. The result to which we must necessarily come in considering this mine, and the experiments made in the ores is, that it can be wrought at a handsome profit over the expenses of mining and smelting. Therefore I unhesitatingly recommend your company to begin regular and systematic mining operations, and to erect your furnace for smelting into pig lead. It is to be considered whether you will separate the silver from the lead yourselves, or sell it to European manufacturers who will pay, on assay, for the silver in the lead. Wood

suitable for smelting operations you have in abundance round your mine, and the road to Portland is very good, so that there is no difficulty as to transportation of the lead to market. The cost of transportation of merchandise to Portland is small, and that of lead will be still less. A road is required to the mine, and your agent has already begun to construct it, and probably has it now ready.

ASSAYS OF SHELBURNE LEAD ORE.

Sample No. 1.—500 grains of the silver galena, reduced to metal, yielded 380 grains of lead, which on cupellation gave 0·99 grains of silver or nearly $\frac{1}{500}$ the ore, or $\frac{1}{380}$lbs. on the lead. The lead amounted to 76 per cent. One ton of the lead will yield 5 $\frac{421}{1000}$ of silver.

Sample No. 2.—500 grains of the crystallized galena mixed with iron pyrites, on being smelted yielded 330 grains or 66 per cent. of lead, and the lead cupelled yielded 0.7 gr. of silver or 4 $\frac{24}{100}$ per ton of lead.

Sample No. 3.—1000 grains of crystallized lead ore yielded 690 grs. of lead or 69 per cent., the silver separated amounted to $\frac{24}{100}$ grs., 2·87lbs. per ton of lead. This sample was of a more blue color than the others, and more like common galena. It came from the middle vein. You are aware that most of the lead may be saved in cupelling lead for silver, the litharge being run off and saved, and sold in that state or reduced back to metallic lead. When red lead and litharge are in demand, as they are at our numerous flint glass works, there will be no difficulty in disposing of a considerable quantity; and when you furnish more than will sell, you might easily receive the lead and sell it in that state.

I ought to say in closing, that much of the success of mining enterprises depends on the management of the mines and works, and in the relations of the capital invested to the amount of profit that may be reasonably expected. You will of course keep clear of the gambling operations of the stock market, and depend on your mine for remuneration for the labor, capital, and skill, devoted to working it.

I would suggest the propriety of purchasing the rich alloys and mixtures of copper and silver which are brought from some of the mines on Lake Superior, and to separating the silver from the copper by means of your argentiferous lead. For it will cost no more to separate a large than a small proportion of silver from lead, the same amount of fuel being required in the operation.

Respectfully your obedient servant,

CHARLES T. JACKSON,

State Assayer of Ores and Metals.

P. S.—I am making some researches on the fibrous galena, which are not yet completed, and will communicate the result to you hereafter. You have in the report all the facts which bear on the economy of mining at Shelburne, and the cupellation of the lead for silver. I would suggest, if you intend erecting cupelling furnaces, that you should procure some good German workmen from Androesburg mine in the Hartz mountains.

ANALYSIS BY A. A. HAYES, ASSAYER OF THE STATE OF MASSACHUSETTS.

Result of Analysis and Assays of two samples of Galena, designated as Keg of Ore and Package of Ore, received from Captain Colby.

Keg of Ore.—This sample presented masses of clean ore composed of sulphurets of lead, zinc, and iron, with some pyritous copper. The rock which adhered to the ore was principally brown spar, or carbonate of iron mixed with calc-spar; both rendering the reduction of the lead very easy. An average obtained from the sample in the keg was reduced to powder for the assays and analysis; 100 parts of this sample afford 56 $\frac{4}{100}$ lead by analysis.

An assay ton, representing 2000lbs. of this sample gave with fluxes 1100lbs. of silver lead. This is the largest quantity which can be obtained. Besides the lead, an alloy of metals and sulphur was obtained which will be examined hereafter.

An assay ton of the silver lead gave $3\frac{2}{10}$lbs. of pure silver.

Thirty-six hundred and thirty six pounds of this ore will afford 2000lbs. of silver lead, which will contain $3\frac{2}{10}$lbs. of silver.

Package of Ore.—The whole of this sample contained much sulphuret of iron, blende and pyritous copper, besides adhering rocks; 100 parts by analysis afforded $43\frac{4}{10}$lbs. lead. An assay ton of this ore gave 780lbs. of silver lead; this being 33 per cent., while the analysis affords 43 per cent., and shows the greater difficulty of working ore like this sample, containing a number of sulphurets.

An assay ton of the silver lead gave $3\frac{60}{100}$ of pure silver.

Fifty-one hundred and thirty pounds of this ore, are required to produce 2000lbs. of silver lead, containing $3\frac{6}{10}$lbs. pure silver.

Respectfully,

A. A. Hayes,

State Assayer.

Art. VI.—THE ARTESIAN WELL AT CHARLESTON, S. C. By R. N. Lynch, D. D.*

This well, commenced in 1848, by Mr. Andrew C. Welton, under the authority of the City Council, is the fifth effort in Charleston to procure good water by means of an Artesian Well.

In 1824, one was undertaken under the same authority, and sunk to the depth of 335 feet; when the iron rods twisted off in the well, and could not be extracted. In 1826, a second effort was made by private enterprise, and soon abandoned for want of means. In 1846, Captain Bowman undertook one at Fort Sumter, in the harbour, under the authority of the General Government. The appropriation giving out, this work was suspended, after attaining the depth of 360 feet. In 1847, another one was commenced in the city, and was sunk 289 feet. The following year, the City Council engaged the services of Mr. Welton, who had bored many wells in Alabama and other South Western States, with great success. He preferred to commence anew. From that time the work has been perseveringly followed up, with only such delays as were necessary for obtaining tubes, and the well has attained a depth of 1145 feet.

Few wells have presented so may difficulties, or called for greater courage and skill in the engineer.

The superficial soil of Charleston is a loose alluvial sand, about twenty feet thick, the lower half of which is saturated with water. Beneath this lies a stiff, compact clay (post pleiocene), gradually passing into a sand, likewise water-bearing, and about 40 feet thick. At 60 feet below the surface, the firm eocene marl is concentrated, the various strata of which are in the aggregate 650 feet thick. Beneath these, and differing but little from them in mineralogical character, lie the cretaceous strata of as yet unknown thickness. Both the eocene and the cretaceous strata consist of alternating layers of hard limestone, firm marl, sandstones, and loose sands, seldom containing less than 20 per cent. of carbonate of lime. Mr. Welton has had to chisel his way through not less than fifty-four rocks, varying from ten to two feet in thickness, and amounting in the aggregate to about 250 feet. Cast-iron tubes, of 6 feet internal diameter, were at first sunk 80 feet, to exclude the superficial and the post pleiocene sands. But as these succeeded in gradually working their way downwards, passing under the mouth of the tube, and into the well, the tubes were sunk deeper at various times, until finally they rested firmly on a thick rock 230 feet deep.

* Read before the American Scientific Association.

Below this point the alternations continued; and generally underneath a large and hard rock, a bed of loose sand was found, which poured into the well. Such a bed the engineer first strove to exhaust, that is, to draw out with the bucket all the sand that would run in and impede the work. By this operation, repeated at various points, the well finally consisted of a series of chambers, some perhaps of several feet in diameter, one below the other, and all connected together by the narrow neck-like passage of the well, 3½ inches in diameter through the intermediate rocks. At 700 feet the sands ran in so fast and in such quantities, that no progress could be made.

The engineer generally found the well 50 or 100, sometimes 140 feet less deep in the morning than he had left it in the preceding evening. After toiling in vain for a long time to exhaust the streams, it was determined to shut them out by a system of tubing. To do this, the passages through all the rocks had to be opened, from 3½ to fully 5 inches in diameter.

This was done. At the depth of 470 feet there was a rock on which the tools had generally been employed, and which caught the tubes. Withdrawing these, that passage was worked over again. It appeared that a nodule in the rock projected into the passage, and had always driven the tube in an oblique direction. It was at length broken off. Below this rock was a large chamber, and the tools now entering it without losing their perpendicularity, struck the bottom a little on one side of the bore previously made, and which they never could be induced afterwards to enter. From this point down, the whole work had to be done over again.

This was finally effected, and sheet iron tubes were sent down to shut out the sands. The well was then continued down to 1,020 feet. But again the sands came in, and filled the well for over a hundred feet. The tubing, several hundred feet of which had been sent down, was found too light and unmanageable. The engineer resolved to withdraw it, and insert instead wrought-iron tubes 4 7–8 external and 4 inches internal diameter, screwed together so as to form one continuous tube from the bottom of the well to the surface of the earth. This was the largest size which the somewhat warped cast-iron tubing at the top would allow to pass through.

Twenty-four feet of the light tubing obstinately refused to be extracted, and remained fixed in the well, more than 700 feet below the surface. Nothing daunted, the engineer thrust a portion of it aside into the chambers, and cut his way through the rest, and has finally succeeded in sinking the wrought-iron tubes to the depths of 1,102 feet; and has bored 43 feet lower still.

In sinking these tubes, which generally followed a few feet

behind the auger or chisel, little difficulty was met, save from the rocks. When one of these was encountered, the tube was arrested, if possible, a foot or eighteen inches above its surface, and a tool invented by Mr. Welton was sent down, which could be open when on the bottom, so as to cut a hole five inches in diameter, and which could be closed at pleasure, so as to be withdrawn again through the narrow passage of the tube. At times, the tubes would rest immediately on the rock, or would be caught by some protuberance, while passing through it. In this case the tool just referred to, was not sufficient; for it could open out only a certain distance below the mouth of the tube, which it would therefore leave standing on a ledge. Here the engineer, having first drilled a 3½ inch hole entirely through the rock and into the substratum below it, sent down another tool, closed during its descent and made to open out below the rock, and to cut a passage through it, of the requisite size, from the bottom upwards to the mouth of the tube. This done, the tool could be closed and withdrawn. None of these tools caused any embarrassment, or failed to effect their purpose, although worked with a handle more than a thousand feet long.

Notwithstanding the use of the most perfect tubes that could be procured, the sand still continued to give annoyance. As the rods were withdrawn, they would rush in from below with the water, to fill the vacant space, sometimes filling the well to the depth of 60 feet, almost instantaneously. This was remedied by building a reservoir at a sufficient height, from which, as the rods were withdrawn, the water was let into the well, so as to produce a *downward* current through the pipes. Such a current was likewise made use of at times to loosen and start the sands packed about the mouth of the tube and allow it to proceed.

The lateral pressure on the tubes has rapidly increased as they descend, requiring a powerful leverage and heavy blows of a rammer to force them down. When started, however, they frequently descend very rapidly until arrested by a rock. The present system can scarcely be sunk any lower, for although the bottom is free, so great is the lateral pressure that the tubes cannot be started by a power under which the joints shows signs of giving way. Other tubing of such a size as to let down inside of the present system will be speedily procured, when it is hoped the work will again be prosecuted.

A brief notice of the principal tools may not be out of place. The *Rods* used are of pine, about 3¼ inches in diameter, and 30 feet long, tapering at their extremities, where they are armed with iron heads bearing screws. The tool to be used is screwed to a rod, and both are let down into the well until only one end of the rod, bearing a male screw, projects above the mouth of the

well; where it is firmly held by an iron catch or yoke, beneath a suitable iron band on the screw. A second rod is then screwed to the first one, and is similarly let down and caught. A third is screwed to the second, and so on, until the bottom is reached. The upper rod is held suspended either wholly or in part, as the engineer desires, by a movable pulley, and bears a cross-bar on the handle, by means of which the workmen may turn the rods and tools as they please.

The chief tool is the *Auger*, used for boring clays, marl, or any consistent layer not of stony hardness. It is exceedingly simple and ingenious. A stout blade an inch wide and half an inch thick, slightly tapering towards an extremity, is twisted like an auger, and terminates on two cutting edges, like those of a drill for boring iron. About six inches above the point, two bitts, like those of a plane, are securely fastened, one on each side of the central bitt, and are inclined at an angle of 45 degrees, so as to fit exactly its auger-like twist of the blade; the upper extremities of those bitts are extended backwards horizonally, so as to give some support to the lead, when packed above the auger. The upper portion of the central blade terminates in a strong tube with a screw. The auger thus made, is screwed to a metal tube 18 or 20 feet long, and this again is screwed to the lowest or first rod. The earth, cut by the side bitts into shavings, ascends their inclination, and is gradually packed around the stem. In a tenaceous soil, such a lead soon becomes an air and water tight piston in the well, which cannot be extracted from a great depth without great risk of breaking tools and machinery. In Mr. Welton's auger (patented by him and Mr. Cooper, his former partner in Alabama) this difficulty is admirably obviated. The stem, or metal tube above the auger, has three or four suitable orifices near its top. As the load is raised, the water above enters these, passes down, and issues through the apertures beneath the side bitts into the cavity under the load. By a dexterous manipulation of this instrument, in a suitable soil, ten feet may be bored, and the entire load brought up at a single insertion of this auger.

Where rocks are encountered the chisel must be used. This is made in the usual form, and is rendered weighty by the use of one or two iron rods to which it is screwed. A slip link two feet long unites this tool to the wooden rods, which are so suspended that when the chisel is on the bottom the slip link has five or six inches play. The upper rod is raised, say two feet and a half, by which the slip link is tightened, and the chisel is raised two feet. The whole is let fall; the chisel strikes the rock, the rods continue their descent for six inches more, and thus escape the shock of the concussion, which would otherwise quickly shatter

their joints. The detritus of rocks chipped by the chisel, or the mud or sand that collects in the bottom of the well, is extracted by a copper tube or bucket, twenty feet long, of nearly the same diameter as the well, and having a valved bottom. This is likewise the most efficient tool for entering light sands, provided the tubing of the well is made to keep pace with it.

The eccentric chisel and various other tools for enlarging the well, and the instruments for extracting broken rods, lost tools, &c., are equally ingenious and efficient. A description of them, however, would be tedious, and perhaps not made intelligible without drawings. The Charleston Basin is formed by a depression in the cretaceous strata as they descend the Atlantic slope, and pass under the waters of the Atlantic. Its narrow diameter or minor axis, from near Georgetown to Lexington, is about 120 miles. To the northeast the cretaceous strata crop out; to the southwest the lower eocene beds immediately over the cretaceous strata, are seen on the surface, while to the northwest the sands and tertiary clays lie on the granite. It was originally hoped that the lowest tertiary stratum under Charleston would be a water bearing sand, the continuation of that which on the N.W. edge immediately overlies the granite, and is traversed by the chief rivers of the State. This hope has not been realized. The lowest tertiary stratum proved to be an argillaceous marl, in which little or no water was found. We are now boring to reach those cretaceous sands, which are exposed on the N.E. edge of the basin, and which in Alabama yield a plentiful supply of water to several hundred wells. So far, several streams of water have been met, the lowest of which rose in the tubes ten feet over the surface.

Of the geological results of the well nothing need be said here; the fossil it has yielded will find an appropriate place in the forthcoming work of Profs. Tuomey and Holmes.

The temperature of the well has been examined from time to time as the work progressed. For this purpose, we used a Six's Register Thermometer, obtained from Pike, in New York. With this, the temperature at the depth of 900 feet was repeatedly taken and found to be unaffected by its submersion in water to such a depth. We compared it repeatedly with the best thermometers in use before it was submersed. The first experiment was made to try the temperature at the depth of 900 feet. The index marked 82½ F., as before. Some time afterwards, other experiments were made at various depths, with erratic and uncertain results. A careful comparison of it with other instruments, shows that now it permanently marks 12 deg. above the real temperature.

The reputation of the maker, and the first trial by myself

giving a true answer, satisfy me that it was then accurate. Is the present error due to the pressure of the column of water in the well? I am informed that at sea such a submersion would shatter the glass. In the well, we could handle it more gently. It was guarded by a tin cylinder, and let down and handed up by hand, with all possible delicacy and caution.

The following was then offered by Prof. J. L. Smith:

The examination of the calcareous matter through which this well passes, affords many points of interest, both geologically and chemically. In the former point of view, remarks were thought unnecessary, as it has been fully treated of by Professor Tuomey. It has been examined most thoroughly in a chemical sense by myself, and the marl found to contain large quantities of phosphate of lime, as much as from five to eight per cent. This fact is most important in an agricultural point of view, as the marl can be obtained in great abundance, and at little cost; for it will be seen that not only will carbonate of lime be furnished to the soil, but a large amount of phosphate of lime, the fertilizing nature of this last being known. The presence of ammonia and some organic acid were detected in this matter, coming from the bed through which the artesian well penetrated.

Other remarks were made about the fossil infusoriæ that exist in vast numbers.

The origin of the phosphate of lime was also commented on.

ART. VII.—PARTICULARS RELATIVE TO THE LEAD MINE NEAR NORTHAMPTON, MASS.—BY BENJAMIN SILLIMAN, L.L.D., EMERITUS PROFESSOR OF CHEMISTRY, MINERALOGY AND GEOLOGY, IN YALE COLLEGE.*

THE mine is situated about eight miles from Northampton, in a southwesterly direction, and, of course, at the same distance from the great river Connecticut, which affords all necessary facility of transportation to and from the ocean.

NATURE OF THE COUNTRY.

The country immediately contiguous to the river, is generally alluvial, consisting of beautiful meadows. These are bounded, at no great distance from the river, by hills and mountains, composed chiefly of granite, trap and gneiss. They are sometimes

* The above Report was originally published in the "American Mineralogical Journal," in 1810. The Professor says in a note to the editor at that time: "It would have been written differently, in some respects, had it been originally intended for a scientific Journal, but I have not now time to give it in a new form." We republish it as being one of the earliest reports upon any of our mines, and as being in itself an able and valuable paper.

abrupt and lofty, but generally rather undulating, and bounded by pretty large curves. Of the latter description is the country in which the mine in question is situated; it may be called very hilly, although it is hardly mountainous.

THE ROCK AND THE VEIN.

The rock, at those places which I visited, is granite. As I observed gneiss in several places on the hills, it is highly probable that the vein may be somotimes bounded by gneiss and sometimes by granite. I did not see any trap near the mine. The vein, including every thing it contains, is a very magnificent one. It is six or eight feet in diameter, and is known to extend twenty miles; from Montgomery on the southwest, to Hatfield on the northeast. It has been opened at these, and at many intermediate places, and it is more than probable that these are not its ultimate limits. The walls of the vein are very distinct and well defined. They are generally parallel, and incline at an angle of twelve or fifteen degrees, from a perpendicular to the horizon. The bulk of the vein is filled with quartz, which, with sulphate of barytes, and a little crystallized carbonate of lime, constitutes the gangue or matrix of the metallic matters. The quartz is so compact as to need blasting with gunpowder, without which no progress can be made in the mine; and yet, it is often crystallized, so that the large masses which the explosion rends from the rock, are easily shivered into pieces by the blow of a hammer. There is a tendency towards crystallization every where manifested in this vein, which makes it an extremely interesting object to a mineralogist, and affords the miner great facility in reducing the gangue to fragments, and in disengaging the ore. Wherever there is a cavity in the vein, the quartz has shot into numerous crystals, usually very regular, sometimes large, and often so beautiful and brilliant that the cavities look as if studded over with gems. Many of them are sufficiently perfect and beautiful to deserve a place in the choicest cabinets; and hundreds of specimens may be selected, among the rubbish of this mine, more interesting than a majority of those which are preserved in costly collections. They may be observed even on the surface of the earth; where the vein appears among the rocks, they have been in some instances so long exposed to the weather, that they are worn down, and their points and angles rounded. Even where there is no cavity in the quartz as it lies in the vein, its structure is often so far crystalline, that it exhibits in the mass a radiated or columnar appearance, and breaks with the greatest ease at the natural joinings between the crystals.

THE ORE.

The ore for which the mine is worked, is galena. It is both of the broad foliated kind, commonly called potters' lead ore, and of the small foliated kind, usually denominated steel-grained ore. But a small part of the whole vein is filled with the ore; the greater part of the vein is quartz, and among this the lead ore is irregularly interspersed, in masses, from the fraction of an inch, to more than a foot in diameter. It predominates most near the walls, and, at present, is found, in greatest abundance near the eastern side of the vein. It appears to be a very pure and rich ore, and, where it exists at all, very little intermixed with any other matters. It sometimes forms continued veins in the quartz, although it is often interrupted by it; but it immediately appears again, generally at the distance of a few inches, and thus the whole vein of quartz appears more or less spotted and clouded with the lead ore.

The lead was said, by the miners, to increase in quantity as they descended. Indeed, there appears to be enough of the ore to afford large quantities of the lead; it is, however, situated in so hard a rock, that considerable expense must necessarily be incurred in procuring it; and much more in bulk of the rock than of the ore, is separated in the blasting. Were the vein situated in Derbyshire, and were the gangue calcareous, as in the mines of Castleton, there can be no doubt that the enterprise would be vigorously pursued; and, in a country like this, there can be no question of the propriety of prosecuting the undertaking, till at least the average return can be ascertained, by smelting the ore, and bringing it to market. The great extent and width of the vein, seem to indicate an extensive deposit of lead; and although this, like every other mining operation, is necessarily involved in a degree of uncertainty, it is clearly worth a few thousand dollars to ascertain a question so interesting to this country, and which, should the ore prove abundant, and be procured without too much expense, may prove lucrative to the adventurers.

THE MINE.

The shaft was opened before the American war, and, after being neglected for forty years, was again opened in the month of October, 1809. It is now sunk about 60 feet; the whole breadth of the vein, at this place, has been excavated, and they have proceeded horizontally, perhaps 25 or 30 feet. A pair of buckets, each of the capacity of 40 gallons, are constantly traversing the shaft to raise the water and the ore; the water runs down the walls of the vein in abundance; and it is therefore necessary to keep the buckets incessantly in operation. The quan-

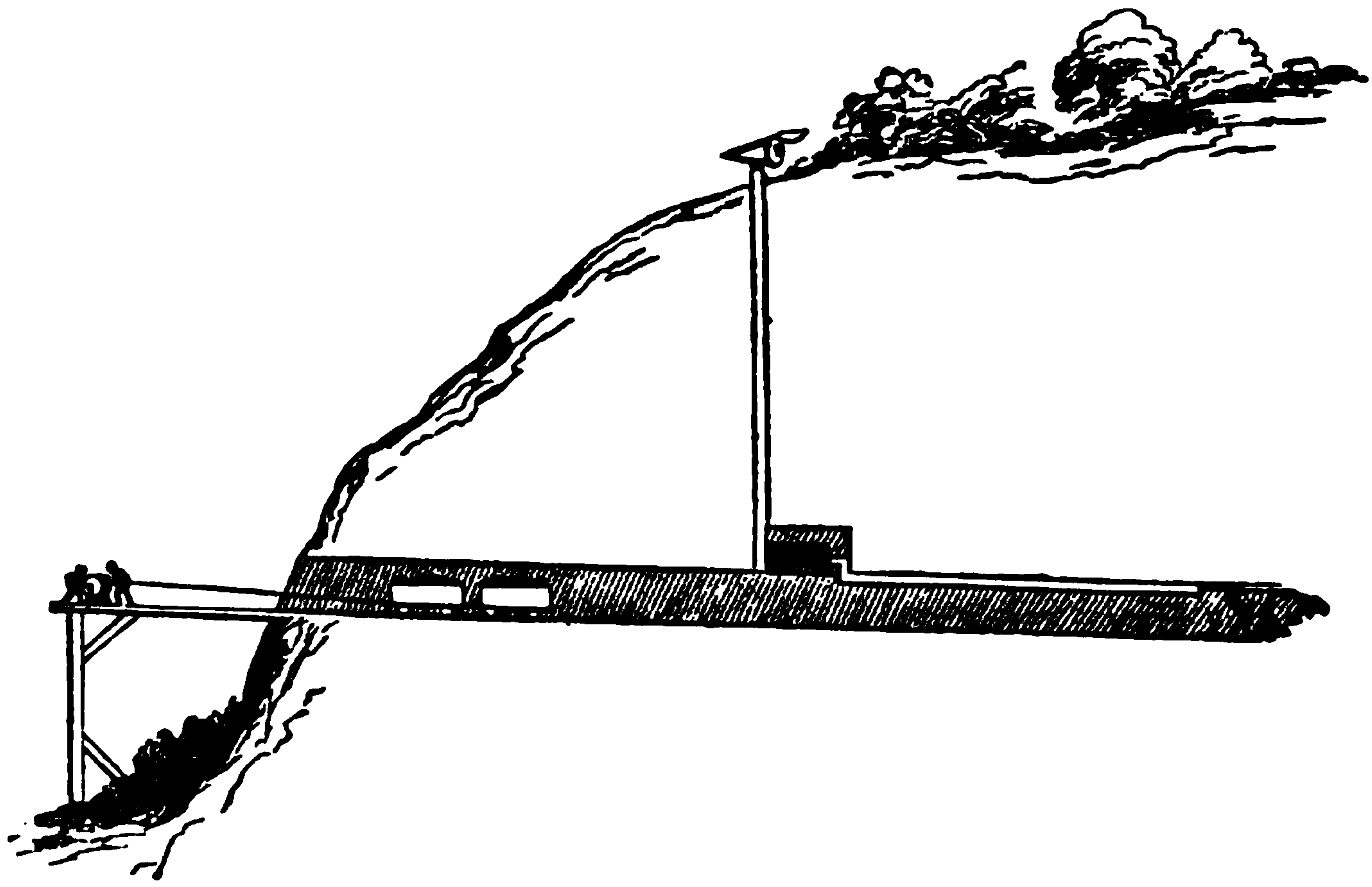
tity of water will doubtless be diminished in the summer; and in any event the steam-engine would afford effectual relief: but the vein is so situated that the water may be drained off from the present depth, and probably from situations considerably lower, by forming a level or gallery to meet the present shaft, at right angles in the earth. If the level were carried from the southeast, at right angles to the course of the vein, it is probable that the water might be drained off by a gallery of fifty rods in length; but, as the excavation would, in that case, traverse rocks where no ore could reasonably be looked for, a considerable expense would be incurred without any immediate remuneration. Therefore, as the country descends in the course of the vein, and, at the distance of one-third or one-half a mile, a small river runs along in a low bed, and as there can be no doubt that the vein of lead ore passes under the river, since it is found on both sides, it would, for these reasons, be best to discover the vein at the river, or in some of the contiguous low grounds, and then to follow it up to the present shaft.

The vein may be certainly discovered by *cross-cutting* the country, and, when found, it would probably more than pay for digging the level, since the level would be carried along in the vein itself. It would be as well to obtain the ore there, as in any other place; the water would be running down constantly towards the river, and would not accumulate; and when the level is carried through to the present shaft, it may be carried still farther up the hill, if the vein in that quarter should prove inviting, of which there are strong indications. The lead appears on the face of the ground, or is discovered by merely removing the soil, or breaking off fragments of the rock. It may be still farther said in favor of carrying a level from the river, or low grounds, near it, that it would not be necessary to dig down from the surface of the ground, but merely to excavate a passage, which would be a kind of subterranean road, and the walls and the roof being of rock, would need no artificial support. This is, indeed, a great advantage in the working of this mine, and forms a compensation for the hardness of the rock, which is not to be disregarded.

Besides the galena, there are found in this mine copper pyrites, dendritic delineations of manganese, and blende: neither of these ores appears to be abundant; the blende is but little valued as an ore of zinc; it is very difficult to obtain metallic zinc from it; and in England it is often (under the name of Black Jack) thrown away as worthless, or used to mend the roads. It is sometimes converted into white vitriol, or sulphat of zinc; but the quantity of this substance which is used is small, compared with what might be produced from blende, were it ex-

tensively manufactured into white vitriol. I have not heard that calamine has been found in this mine.

The copper ore which is found here, is the same that is wrought in Cornwall, and the neighboring country of Wales.



SECTION OF THE LEAD MINE, NEAR NORTHAMPTON.

The lead from this vein is sometimes beautifully crystallized in cubes. I have specimens from this mine, in which the crystals of lead alone, with equally beautiful ones of blende, are deposited upon those of quartz, and in cavities lined with fine quartz crystals; the aggregate forms superb pieces for a cabinet.

ACCIDENTAL ADVANTAGES.

This mine is situated in a country where wood is abundant and cheap, and where, therefore, the smelting can be performed with comparatively little expense, since a wood fire is considered as very well adapted to this operation; for, as it is performed in a reverberatory furnace, the copious flame of wood is particularly advantageous. There is also the advantage of a good stream of water, within half a mile. This stream is sufficiently powerful to work the stamping machines, and carry bellows by water, should any be needed; it may also serve a useful purpose in dressing the ore, and helping to free it from its strong matrix.

May 16, 1810.

P.S.—Since this account was written, I have subjected the lead ore of the mine described above to a chemical examination, of which I will mention merely the results. By processes conducted in such a manner as to resemble, as nearly as possible, the operations *in the large way*, the ore affords from 50 to 60 per cent. of good soft lead; specimens perfectly freed from all

foreign matters, will yield more; but it is better to take an average rather below than above the truth. I obtained a silver globule in every instance, in eleven operations, by cupellation, but the portion of silver is too small to admit of profitable extraction; it is only 12¼ oz. to the ton.

Art. VIII.—THE COPPER AND IRON REGION OF LAKE SUPERIOR.*

Il n'est point d'objet sur lequel on recontre communément plus d'opinions erronées que sur les mines.—*Heron de Villefosse, de la richesse minérale. Vol.* 1, p. 449.

It is no wonder that the mineral riches of the Lake Superior country, its wealth of Copper and Iron (and perhaps of silver), and the many and various features of interest it presents to the Geologist and Mineralogist, have begun to attract the attention of men of science in Europe. While the capitalist has confined his attention to the copper and iron, the geologist is attracted by the peculiar conformation of this region, its bold and precipitous shore, the alternate ranges of sandstone, trap, and conglomerate, and the interesting specimens of pure silver, sulphate and oxide of copper, as well as pure copper, of Dolomite marble (described as of a beautiful pink hue), of Malachite, Zeolite Analcim, of Amygdaloid, and other varieties of trap, and of trap-like Epidote, the unfailing companion of the pure copper, with which pure silver is often found throughout the whole of the trap-ranges.

Agassiz, whom every American is proud to claim as a citizen by other ties of allegiance than those of the republic of letters, has visited the Lake Superior region, and described its physical character, vegetation, and animals with all his characteristic sagacity and carefulness of observation.† In the summer of 1850, Mr. Fr. C. L. Koch, a member of the Council of Mines of Brunswick, visited Lake Superior. Mr. Koch was a man of great attainments in natural science, and also practically familiar with mining. In the romantic valley of Grünenplau, in the Weser District of Brunswick, he established a glass-factory, and was the proprietor

* Die Mineral-Regionen der obern Halbinsel Michigan's (N. A.) am Lake Superior und die Isle Royale, von Fer. C. L. Koch. Gottingen, 1852. The Mineral Regions of the Upper Peninsula of Michigan (N. A.) on Lake Superior and Isle Royale, by Fr. C. L. Koch, Member of the Brunswick Council of Mines, and the Royal Hanoverian Guelphin Order, 4th class, etc. With a Geognostic Map, &c. Gottingen, 1852.

† Lake Superior, its Physical Character, Vegetation, Animals, etc., by Louis Agassiz, etc. Boston: Gould, Kendall & Lincoln, 59 Washington-street, 1850.

of iron-works at Carlshütte. By his enterprise and talents, of which his visit to the distant region of Superior was but one of many proofs, he has not only secured affluence for his own family, but provided the means of livelihood for many families of workmen. He was the soul of the valley, the father of the many operatives employed in the glass-works and iron-works, and was ever anxious to provide for their spiritual as well as temporal wants, as is attested by the church which he had begun at Grünenplau, but which he was not allowed to finish; for the useful career of this practical as well as learned man has been prematurely closed by death. During the whole of his journey in the Lake Superior country, he was suffering from fever, and in his preface he speaks feelingly of the kindness of many German and American friends, without whose services his journey through that wilderness would have been impossible. He returned home sick, but not dangerously so; proper care and attention would probably soon have restored him, had not a fatal accident cut short his laborious career. He died on the 12th March, 1852.

We have gathered these particulars from an affectionate tribute to his friend's memory, which Mr. J. F. L. Hausman, of Göttingen, has appended to the work. Mr. Hausman is the author of a Treatise on Geology, published, we think, in 1845. Mr. Koch had written considerably on scientific subjects, and had made a number of contributions to the Göttingen Mining Society (*Verlin Bergmannicher Freunde*).

Mr. Koch's work is chiefly interesting to the American reader for the personal observations of the writer being later, we believe, than any others published, and for his clear classification of the results of the surveys. His work is in the main made up from the official reports published by government, and in particular the very valuable report of Dr. C. T. Jackson, published among the documents accompanying the Message in December, 1849. Mr. Koch also expresses a deservedly high opinion of the scientific labors of Dr. Douglas Houghton, the State Geologist of Michigan, by whom the first official survey of the region was made in 1844. Dr. Houghton perished at the scene of his labors, when nearly completed, off Keweenaw Point, in 1845. Dr. Houghton's survey was both linear and geological, and required a rare combination of geological science with skill as a surveyor. The results of his labors, as derived from his journals and other papers, together with very valuable reports by Mr. W. A. Burt, Dr. Houghton's chief assistant on the part surveyed, and by Mr. Bela Hubbard, State Geologist of Michigan, on the remaining portion, were published at Buffalo in 1846.*

* Reports on the Mineral Region of Lake Superior, &c. Buffalo: L. Danforth, 230 Main-street, 1846.

The Reports of Messrs. J. W. Foster and J. D. Whitney, were published, the first part, in 1850, on the Copper Lands, and the second part, on the Iron Region, in 1852. These works, together with those we have already mentioned, complete, we believe, the *literature* of the Lake Superior Mining Region, a topic as rich in interest to the man of science as its rocks are in wealth for the man of trade; and the one is destined to receive as careful *exploitation* from the student as the other is from the capitalist.

Mr. Koch's division of his subject is pointed out by nature herself, and is the one followed by some previous writers. The mineral treasures of Michigan are found in two distinct belts of rock: the northern running through Keweenaw Point, and so westerly on and near the shore of the lake, and easterly near Keweenaw bay and Huron bay, is composed of trap, and contains the copper; the southern, which runs west from the shore of the lake at the mouth of Chocolate river, is composed of silicious rocks, and contains the iron and iron ores.

The little town of Worcester, situated on the shore of the lake, in latitude 46° 32′ north, is the eastern terminus, as it were, of the iron region. This region is of the average width of 10 to 15 miles, and extends westerly from the lake about 70 miles. Dead river forms a natural boundary on the north, and the township line, 46 north, may be assumed as its southern limit.

South of the iron region, and extending east and west of Escanabo river, lies an extensive granite district; granite also occupies the space between Dead river and the southern limit of the copper region. The granite south of the iron region is at times found to contain hornblende, and to be pure syenite, but is usually rich feldspar, or quartz and feldspar united, the former predominating. In the southern part of the district, the feldspar is of a red color, and gives the stone its prevailing red hue. Sometimes the granite is traversed by irregular veins of quartz north of Dead river, the granite is traversed by broad and irregular dykes.

When it is considered that the whole of the great valley of the Mississippi, from north to south, is only of secondary formation, this great store of granite which Mr. Koch describes as easily broken and worked, and yielding a very beautiful as well as durable building stone, may prove not the least valuable of the mineral resources of Michigan. So soon as greater facilities of communication are afforded with the lower lakes and the Mississippi, it will doubtless become a valuable article of trade.

Between these two granite districts lies the belt of metamorphic rocks, in which the iron ores are found. The rocks are white and dark quartz, talc schist, argillaceous schist, hornblende, and

specular and micaceous oxides of iron. They form a chain of hills varying from 40 to 150 feet in height, running northwest from the mouth of Carp river along the line of township 48, range 26. Mr. Koch observes that no well-formed trap is found here, yet it seems to be the basis, and to be covered with metamorphic rocks. The alteration of the rocks indicates the approach of an igneous mass to the surface. Later observations have detected many other indications of an upheaving of trap, and perhaps the quartz and ironstone hills are attributable to it.

These rocks are completely impregnated with the argillaceous red and micaceous oxides of iron, sometimes in detached masses, at others in beds and veins. The largest district of iron ore is in township 47, range 26. Here are two great hills of iron ore, consisting almost entirely of magnetic iron ore, and specular iron ore. It has a lamellar structure, easily breaking into subrhomboidal fragments, so that the labor of mining is comparatively slight.

This district is richer in iron ore than any other in the country. The largest of the great iron districts of New-York is 1000 feet long and 700 feet broad. The northern of the two hills of this district is at least a quarter of a mile long, and nearly 1000 feet broad.

Among the results of the latest observations in this region, Mr. Koch announces the discovery of a very beautiful dolomite marble, which occurs in the metamorphic quartz. Five marble districts have been thus far found, the largest of which, between Worcester and Jackson Forge, was vented by Mr. Koch. It is a ridge more than ten miles long, running nearly east and west. The marble is of a fine grain, and combines firmness of texture with beauty, the pink here being very agreeable. It yields also an excellent lime, and three Germans have already established a kiln, from which the town of Worcester is supplied.

Mr. Koch gives the following analysis of the marble by Mr. Wenderott, of the Laboratory at Cassel :—

Silicate,	8,00
Oxide of iron,	6,00
Carbonate of lime,	41,00
Carbonate of Magnesia,	41,85
Loss,	3,15
Total,	100,00

Other deposits of iron have lately been discovered, the chief of which are in township 47, range 27. The northeast, west, and southwest sections. In this district there are large masses of trap, inclosing little lakes, one of which—Teal lake—affords some lovely views to the traveller on the road which passes its western shore.

The chief element of all the iron ores, examined by Mr. Koch, is oxide of iron, and he differs from Messrs. Foster and Whitney with regard to "an admixture of the fine-grained magnetic."*

We have not the space to accompany Mr. Koch in his interesting tour through the copper region so fully and minutely as in his description of the iron district. The iron is a later discovery, and it may be that the granite, marble and iron of the southern district, will prove as valuable as the copper of the lake shore. The copper region is comparatively well known. It extends from Montreal river, the western limit of the upper peninsula of Michigan, to the eastern extremity of Keweenaw Point, and also includes Isle Royale, which belongs to the State of Michigan. The length of the district is 150 miles.

The prevailing rock of this district is sandstone, forming a belt 15 to 30 miles wide. Throughout the entire length of this belt, and nearly in the middle of it, a solid mass of trap, from 1¼ to 8 miles thick, is found breaking through the sandstone. Isle Royale consists almost entirely of trap, with some admixture of conglomerate and sandstone.

The shore of Lake Superior is bold and rocky, but it affords some good harbors. The best are Copper, Agate, and Eagle Harbors, on the north side of Keweenaw Point. Ontonagon river admits vessels drawing five feet water.

Mr. Koch divides the copper region into four districts:

1. Keweenaw Point.
2. Porcupine mountain.
3. Montreal river and Portage lake.
4. Isle Royale.

The Keweenaw Point district was surveyed by Dr. Houghton, whose report to the Legislature of Michigan was made in 1841. It is to this indefatigable man of science that we are indebted for the system of combined linear, topographical, and geological surveys, than which there can be no more thorough mode of ascertaining the character and resources of an unexplored country. This becomes evident when it is considered that the system of linear survey in this country, is so regulated as to embrace every 16th of a square mile. Every township of six miles square has to be surveyed and divided into 36 sections of a square mile each; each section is divided into quarters of 160 acres each, and each quarter into four lots of 40 acres each. Now, a survey of the geology, mineral resources, and natural productions of a country as minute as this linear survey of its surface, a survey in short which examines every forty acres of a country, can hardly fail to disclose all its resources. Such was the survey which Dr. Houghton

* p. 44.

in part executed in Michigan, and which his untimely death prevented him from completing.

Keweenaw Point is traversed by two ridges of trap, which is the prevailing rock, it is accompanied by conglomerate and sandstone.

The Porcupine mountains contain the highest elevation in Michigan, some peaks being 1400 feet high. This district is separated from the trap-range on the south by a belt of sand stone, 7 miles wide. The rocks are sandstone, conglomerate, and trap, in the northern portion of this district, and the southern portion consists of quartz or jasper. The greater part is a compact jasper of a dark red color.

The district between Montreal river and Portage lake consists of trap rock, running from northeast to southwest, and separated by Portage lake from Keweenaw Point, with which however it is probably connected beneath the lake. For one-third of the distance the range of trap is only 1½ to 4 miles wide, but widens as it goes west. The principal rocks occurring in this district are red sandstone, conglomerate, limestone, various species of trap, quartz, and epidote rock. The most interesting of these by far are the trap and epidote.

The thick solid trap east of Ontonagon river is rich in magnetic iron ore.

Amygdaloid trap is also found here and there in the trap ranges, accompanied near Agogebic lake by epidote.

Porphyry has as yet been found only in detached pieces.

The breccia which is found seems to be a mixture of trap and sandstone.

The epidote trap occurs on the Ontonagon river, the epidote taking the place of hornblende in the solid trap, and forming by a gradual transition a compact epidote trap. Sub-veins of quartz and calcspar containing copper ores are almost always accompanied by epidote.

Epidote rock occurs in as many varieties as the trap-rock proper; and although the trap predominates, yet in some sections the epidote forms entire masses. It is found in veins and subveins, generally pure and often of a shining crystalline texture, like greenstone. Epidote has often an amygdaloid structure, with its hollows filled with quartz and calcspar. It is the constant companion of metallic copper in this district.

The occurrence of native copper, sometimes with native silver throughout the entire trap region, is a fact of the utmost interest and importance. It is well known that in all parts of this district, masses of native copper of considerable size have often been found. Wherever the trap range is opened for any distance between Portage lake and Montreal river this metal is found in

the native state, near the surface covered with a coat of red oxide or green carbonate.

The Isle Royale district consists of trap of the greenstone, porphyry and amygdaloid varieties, with some conglomerate and sandstone on the southwest side. "The geological character of the island corresponds with that of Keweenaw Point, and its formation must be of the same relative age with that." Such is the opinion quoted by Mr. Koch from Dr. Jackson's report.

Copper mining on Lake Superior has been attended with many uncertainties and much ill success. The prophecies of Dr. Houghton, made so early as 1841, as to the danger of ill-considered attempts at mining operations without adequate capital, have been fully verified. Previous to 1846 not less than 53 companies for mining copper in the Lake Superior region had been formed, of which at the time of Dr. Koch's visit hardly a fourth were in active operation. But many of these undertakings, says Mr. Koch, were abandoned prematurely, before the hidden treasures had been discovered.

Mining operations are now conducted under far more favorable conditions, with greater science, more accurate knowledge of the country and adequate capital. They are confined almost exclusively to procuring native copper; the chief works are at Keweenaw Point, Ontonagon river, and Isle Royale.

Keweenaw Point.—The chief mines here are at Eagle river, three miles from which are the Cliff and North American mines, and Eagle harbor, near which are the Copper Falls and Northwest mines. Cliff mine belongs to the Boston and Pittsburg Company, and lies immediately at the foot of a cliff of trap-rock, 200 or 300 feet high. 180 or 200 men are employed, one-half above, the other half under ground in this "Wonder of the World," as Mr. Koch says the Americans justly call the mine, in procuring the rich masses of copper and ore. It was discovered by Dr. Jackson some years since, and the land was taken up in 1845.

Copper Falls mine was opened in 1844, on the recommendation of Dr. Jackson. The Lac la Belle mine is the only one at which mining for copper ore is mainly carried on. At all the other mines only the native copper is sought for; mining for the ores having been abandoned on the northern shore of Keweenaw Point, and on the south side also, west of Lac la Belle.

The Suffolk Mining Company undertook to mine for ore in township 57, range 31. The ore was gray copper and some malachite. Melted without preparation, it yielded more iron than copper, the reduction of the former being effected by the lime from the ore and the trap-rock. The result was a mass consisting of ¾ iron and ¼ black copper. This result led to an

abandonment of the undertaking; and the case affords, as Mr. Koch remarks, a striking example of the ill-considered rashness with which such enterprises are begun, carried on, and given up.

Mr. Koch was unable to visit the Ontonagon district, a most important and interesting part of the copper region, the point to which most attention is now directed, and the centre of by far the most of the late mining operations. He mentions no less than 13 companies occupying this district, among which are the Minnesota Company, of whose operations he expresses a very favorable opinion, and of whose charter and by-laws he gives a translation as a specimen of the organization and relation to the state of an American Mining Company, the Ridge Mining Company, the Ontonagon Adventure, and Aztec, Douglas Houghton, Algonquin, Forest Mine, Ohio Trap-rock, Piscataqua (opened in 1850), Norwich, Merchants' and Chesapeake.

Isle Royale.—There were but two companies in operation here at the time of Mr. Koch's visit: Siskawit Mining Company in township 66, range 34, on the south side of Rock harbor, and the Pittsburg and Isle Royale Company at Todd's harbor, which Dr. Jackson has pronounced one of the best districts for mining on the northwest side of the island.

Mr. Koch's work is accompanied by an admirable map of the mineral region of Lake Michigan, beautifully lithographed by Fischer, of Cassel.

JOURNAL OF MINING LAWS AND REGULATIONS.

AN ACT *to amend "an act to authorize the formation of corporations for manufacturing, mining, mechanical or chemical purposes, passed February* 17*th*, 1848."

Passed June 7th, 1853.

The People of the State of New-York, represented in Senate and Assembly, do enact as follows:

§ 1. Any certificate heretofore filed under the provisions of the above entitled act may designate one or more places where the company may carry on their business.

§ 2. The Trustees of such company may purchase mines, manufactories and other property necessary for their business, and issue stock to the amount of the value thereof, in payment therefor; and the stock so issued shall be declared and taken to be full stock, and not liable to any further calls, neither shall the holders thereof be liable for any further payments, under the provisions of the tenth section of the said act; but in all statements and reports of the company to be published, this stock shall not be stated or reported as being issued for cash paid in to the company; but shall be reported in this respect according to the fact.

§ 3. This act shall take effect immediately.

AN ACT *to authorize the formation of corporations for manufacturing, mining, mechanical or chemical purposes.*

Passed February 17th, 1848.

The People of the State of New-York, represented in Senate and Assembly, do enact as follows:

§ 1. At any time hereafter, any three or more persons who may desire to form a company for the purpose of carrying on any kind of manufacturing, mining, mechanical or chemical business, may make, sign and acknowledge before some officer competent to take the acknowledgment of deeds, and file in the office of the clerk of the county in which the business of the company shall be carried on, and a duplicate thereof in the office of the Secretary of State, a certificate in writing, in which shall be stated the corporate name of the said company, and the objects for which the said company shall be formed, the amount of the capital stock of the said company, the terms of its existence, not to exceed fifty years, the number of shares of which the said stock shall consist, the number of trustees and their names, who shall manage the concerns of said company for the first year, and the names of the town and county in which the operations of the said company are to be carried on.

§ 2. When the certificate shall have been filed as aforesaid, the persons who shall have signed and acknowledged the same, and their successors, shall be a body politic and corporate, in fact and in name, by the name stated in such certificate; and by that name have succession, and shall be capable of suing and being sued in any court of law or equity in this State, and they and their successors may have a common seal, and may make and alter the same at pleasure; and they shall, by their corporate name, be capable in law of purchasing, holding and conveying any real and personal estate whatever which may be necessary to enable the said company to carry on their operations named in such certificate, but shall not mortgage the same or give any lien thereon.

§ 3. The stock, property and concerns of such company shall be managed by not less than three nor more than nine trustees, who shall respectively be stockholders in such company and citizens of the United States, and a majority of whom shall be citizens of this state, who shall, except the first year, be annually elected by the stockholders, at such time and place as shall be directed by the by-laws of the company; and public notice of the time and place of holding such election shall be published not less than ten days previous thereto, in the newspaper printed nearest to the place where the operations of the said company shall be carried on; and the election shall be made by such of the stockholders as shall attend for that purpose, either in person or by proxy. All elections shall be by ballot, and each stockholder shall be entitled to as many votes as he owns shares of stock in the said company, and the persons receiving the greatest number of votes shall be trustees; and when any vacancy shall happen among the trustees, by death, resignation or otherwise, it shall be filled for the remainder of the year in such manner as may be provided for by the by-laws of the said company.

§ 4. In case it shall happen at any time, that an election of trustees shall not be made on the day designated by the by-laws of said company, when it ought to have been made, the company for that reason shall not be dissolved, but it shall be lawful on any other day, to hold an election for trustees, in such manner as shall be provided for by the said by-laws, and all acts of trustees shall be valid and binding as against such company, until their successors shall be elected.

§ 5. There shall be a president of the company, who shall be designated from the number of the trustees, and also such subordinate officers as the company by its by-laws may designate, who may be elected or appointed, and required to give such security for the faithful performance of the duties of their office as the company by its by-laws may require.

§ 6. It shall be lawful for the trustees to call in and demand from the stockholders respectively, all such sums of money by them subscribed, at such times, and in such payments or instalments as the trustees shall deem proper, under the penalty of forfeiting the shares of stock subscribed for, and all previous payments made thereon, if payment shall not be made by the stockholders

within sixty days after a personal demand or notice requiring such payment shall have been published for six successive weeks in the newspaper nearest to the place where the business of the company shall be carried on as aforesaid.

§ 7. The trustees of such company shall have power to make such prudential by-laws as they shall deem proper for the management and disposition of the stock and business affairs of such company, not inconsistent with the laws of this State, and prescribing the duties of officers, artificers, and servants that may be employed; for the appointment of all officers, and for carrying on all kinds of business within the objects and purposes of such company.

§ 8. The stock of such company shall be deemed personal estate, and shall be transferable in such manner as shall be prescribed by the by-laws of the company; but no shares shall be transferable until all previous calls thereon shall have been fully paid in, or shall have been declared forfeited for the non-payment of calls thereon: And it shall not be lawful for such company to use any of their funds in the purchase of any stock in any other corporation.

§ 9. The copy of any certificate of incorporation, filed in pursuance of this act, certified by the county clerk or his deputy, to be a true copy, and of the whole of such certificate, shall be received in all courts and places, as presumptive legal evidence of the facts therein stated.

§ 10. All the stockholders of every company incorporated under this act, shall be severally individually liable to the creditors of the company in which they are stockholders, to an amount equal to the amount of stock held by them respectively for all debts and contracts made by such company, until the whole amount of capital stock fixed and limited by such company shall have been paid in, and a certificate thereof shall have been made and recorded as prescribed in the following section; and the capital stock, so fixed and limited, shall all be paid in, one half thereof within one year, and the other half thereof within two years from the incorporation of said company, or such corporation shall be dissolved.

§ 11. The president and a majority of the trustees, within thirty days after the payment of the last instalment of the capital stock, so fixed and limited by the company, shall make a certificate stating the amount of the capital so fixed and paid in; which certificate shall be signed and sworn to by the president and a majority of the trustees; and they shall, within the said thirty days, record the same in the office of the county clerk of the county wherein the business of the said company is carried on.

§ 12. Every such company shall annually, within twenty days from the first day of January, make a report which shall be published in some newspaper, published in the town, city or village, or if there be no newspaper published in said town, city or village, then in some newspaper published nearest the place where the business of said company is carried on, which shall state the amount of capital, and of the proportion actually paid in, and the amount of its existing debts, which report shall be signed by the president and a majority of the trustees; and shall be verified by the oath of the president or secretary of said company, and filed in the office of the clerk of the county where the business of the company shall he carried on; and if any of said companies shall fail so to do, all the trustees of the company shall be jointly and severally liable for all the debts of the company, then existing, and for all that shall be contracted before such report shall be made.

§ 13. If the trustees of any such company shall declare and pay any dividend when the company is insolvent, or any dividend, the payment of which would render it insolvent, or which would diminish the amount of its capital stock, they shall be jointly and severally liable for all the debts of the company then existing, and for all that shall be thereafter contracted, while they shall respectively continue in office: *Provided*, That if any of the trustees shall object to the declaring of such dividend or to the payment of the same, and shall at any time before the time fixed for the payment thereof, file a certificate of their objection in writing with the clerk of the company and with the clerk of the county, they shall be exempt from the said liability.

§ 14. Nothing but money shall be considered as payment of any part of the capital stock, and no loan of money shall be made by any such company to any stockholder therein; and if any such loan shall be made to a stockholder, the officers who shall make it, or who shall assent thereto, shall be jointly and severally liable to the extent of such loan and interest, for all the debts of the company contracted before the re-payment of the sum so loaned.

§ 15. If any certificate or report made, or public notice given, by the officers of any such company, in pursuance of the provisions of this act, shall be false in any material representation, all the officers who shall have signed the same, knowing it to be false, shall be jointly and severally liable for all the debts of the company contracted while they are stockholders or officers thereof.

§ 16. No person holding stock in any such company, as executor, administrator, guardian or trustee, and no person holding such stock as collateral security, shall be personally subject to any liability as stockholder of such company; but the person pledging such stock shall be considered as holding the same, and shall be liable as a stockholder accordingly, and the estates and funds in the hands of such executor, administrator, guardian or trustee, shall be liable in like manner, and to the same extent as the testator or intestate, or the ward or person interested in such trust fund would have been, if he had been living and competent to act, and held the same stock in his own name.

§ 17. Every such executor, administrator, guardian or trustee shall represent the share of stock in his hands at all meetings of the company, and may vote accordingly as a stockholder; and every person who shall pledge his stock as aforesaid, may nevertheless represent the same at all such meetings, and may vote accordingly as a stockholder.

§ 18. The stockholders of any company organized under the provisions of this act, shall be jointly and severally individually liable for all debts that may be due and owing to all their laborers, servants and apprentices, for services performed for such corporation.

§ 19. The legislature may at any time alter, amend or repeal this act, or may annul or repeal any incorporation formed or created under this act; but such amendment or repeal shall not, nor shall the dissolution of any such company take away or impair any remedy given against any such corporation, its stockholders or officers, for any liability which shall have been previously incurred.

§ 20. Any corporation or company heretofore formed, either by special act or under the general law, and now existing for any manufacturing, mining, mechanical or chemical purposes, or any company which may be formed under this act, may increase or diminish its capital stock by complying with the provisions of this act, to any amount which may be deemed sufficient and proper for the purposes of the corporation, and may also extend its business to any other manufacturing, mining, mechanical or chemical business, subject to the provisions and liabilities of this act. But before any corporation shall be entitled to diminish the amount of its capital stock, if the amount of its debts and liabilities shall exceed the amount of capital to which it is proposed to be reduced, such amount of debts and liabilities shall be satisfied and reduced so as not to exceed such diminished amount of capital; and any existing company, heretofore formed under the general law, or any special act, may come under and avail itself of the privileges and provisions of this act, by complying with the following provisions, and thereupon such company, its officers and stockholders, shall be subject to all the restrictions, duties and liabilities of this act.

§ 21. Whenever any company shall desire to call a meeting of the stockholders, for the purpose of availing itself of the privileges and provisions of this act, or for increasing or diminishing the amount of its capital stock, or for extending or changing its business, it shall be the duty of the trustees to publish a notice signed by at least a majority of them, in a newspaper in the county, if any shall be published therein, at least three successive weeks, and to deposit a written or printed copy thereof in the post-office, addressed to each

stockholder at his usual place of residence, at least three weeks previous to the day fixed upon for holding such meeting: specifying the object of the meeting, the time and place, when and where such meeting shall be held, and the amount to which it shall be proposed to increase or diminish the capital, and the business to which the company would be extended or changed, and a vote of at least two-thirds of all the shares of stock shall be necessary to an increase or diminution of the amount of its capital stock, or the extension or change of its business as aforesaid; or to enable a company to avail itself of the provisions of this act.

§ 22. If at any time and place specified in the notice provided for in the preceding section of this act, stockholders shall appear in person or by proxy, in number representing not less than two-thirds of all the shares of stock of the corporation, they shall organize by choosing one of the trustees chairman of the meeting, and also a suitable person for secretary, and proceed to a vote of those present, in person or by proxy, and if on canvassing the votes it shall appear that a sufficient number of votes has been given in favor of increasing or diminishing the amount of capital, or of extending or changing its business as aforesaid, or for availing itself of the privileges and provisions of this act, a certificate of the proceedings, showing a compliance with the provisions of this act, the amount of capital actually paid in, the business to which it is extended or changed, the whole amount of debts and liabilities of the company, and the amount to which the capital stock shall be increased or diminished, shall be made out, signed, and verified by the affidavit of the chairman, and be countersigned by the secretary, and such certificate shall be acknowledged by the chairman, and filed as required by the first section of this act, and when so filed, the capital stock of such corporation shall be increased or diminished to the amount specified in such certificate, and the business extended or changed as aforesaid, and the company shall be entitled to the privileges and provisions, and be subject to the liabilities of this act, as the case may be.

§ 23. If the indebtedness of any such company shall at any time exceed the amount of its capital stock, the trustees of such company assenting thereto, shall be personally and individually liable for such excess to the creditors of such company.

§ 24. No stockholder shall be personally liable for the payment of any debt contracted by any company formed under this act, which is not to be paid within one year from the time the debt is contracted, nor unless a suit for the collection of such debt shall be brought against such company within one year after the debt shall become due; and no suit shall be brought against any stockholder who shall cease to be a stockholder in any such company, for any debt so contracted, unless the same shall be commenced within two years from the time he shall have ceased to be a stockholder in such company, nor until an execution against the company shall have been returned unsatisfied in whole or in part.

§ 25. It shall be the duty of the trustees of every such corporation or company to cause a book to be kept by the treasurer or clerk thereof, containing the names of all persons alphabetically arranged, who are or shall, within six years, have been stockholders of such company, and showing their places of residence, and the number of shares of stock held by them respectively, and the time when they respectively became the owners of such shares; and the amount of stock actually paid in; which book shall, during the usual business hours of the day, on every day except Sunday and the fourth day of July, be open for the inspection of stockholders and creditors of the company, and their personal representatives, at the office or principal place of business of such company, in the county where its business operations shall be located; and any and every such stockholder, creditor, or representative shall have a right to make extracts from such book, and no transfer of stock shall be valid for any purpose whatever, except to render the person to whom it shall be transferred liable for the debts of the company, according to the provisions of this act, until it shall have been entered therein as required by this section, by an entry

showing to and from whom transferred. Such book shall be presumptive evidence of the facts therein stated, in favor of the plaintiff, in any suit or proceeding against such company, or against any one or more stockholders. Every officer or agent of any such company, who shall neglect to make any proper entry in such book, or shall refuse or neglect to exhibit the same, or allow the same to be inspected, and extracts to be taken therefrom, as provided by this section, shall be deemed guilty of a misdemeanor, and the company shall forfeit and pay to the party injured a penalty of fifty dollars for every such neglect or refusal, and all the damages resulting therefrom: And every company that shall neglect to keep such book open for inspection as aforesaid, shall forfeit to the people the sum of fifty dollars for every day it shall so neglect, to be sued for and recovered in the name of the people, by the district attorney of the county in which the business of such corporation shall be located; and when so recovered, the amount shall be paid into the treasury of such county for the use thereof.

§ 26. Every corporation created under this act shall possess the general powers and privileges and be subject to the liabilities and restrictions contained in title third of chapter eighteen of the first part of the Revised Statutes.

§ 27. This act shall take effect immediately.

COMMERCIAL ASPECT OF THE MINING INTEREST.

As will be seen by the following report of prices of mineral stocks at the *New-York Stock Exchange*, there has been a general falling off particularly in the coal stocks during the month of July. There are many companies not placed in the list which are bought and sold at the Mining Board. In our next issue we shall give a list of those which are active, and a comparison of their prices during the month of August. Of course many of them being new, it has been difficult to give all the particulars we could have wished; but as they are more dealt in and become more familiar to the public, this difficulty will disappear. It appears to us that a sufficient number of new companies has been brought upon the market at present, and the great object of the managers of those now brought out, should be to develope the resources of their companies in an economical manner, so as to produce results and give the public confidence in them as investments. It has been the habit of many parties connected with the mining interest to get up a company, dispose of the shares, and then let it take care of itself, while they go on with the manufacture of some other company. *This will not do.* It will destroy or retard the attainment of that high character which the mining interest in this country is yet destined to possess.

The coal stocks of the Cumberland region have experienced the greatest decline, owing to the difficulty of transportation to market. And therefore the extent of their profits yet remains a problem.

In copper stocks the fall has also been considerable, but generally speaking the prices have been well sustained. On most of the above description of stocks loans have been made at a high rate of interest, which having been called in has obliged the parties to dispose of them at the best rates.

Lake Superior, North Carolina, Tennessee and Virginia appear to be points most abundant in copper. The first however is, so far, immeasurably superior to the others in mineral wealth, and has with a single exception alone produced

dividend paying mines. In the course of a year or so these will be greatly increased and a judicious investment will give as handsome a return for money as in any other species of property. In the other points the mines being new, caution should be exercised in the investment of money, and when the managers are men of known probity and caution, there will be more security than in enterprises formed for the purpose of speculation alone.

The circle which takes an interest in this description of property is gradually, but surely widening; and if care is had that this growing confidence is not abused, it will not be long before the public will be as ready to place a portion of their means in it as in any thing else. From the geologist who explores and reports, to the managers who form and conduct, there should be the most rigid adherence *to truth.* And in the formation of companies, managers should not take the lion's share, but allow the public to participate in the enterprise at its commencement for a fair remuneration of time, risk, and expense. In the management there should be economy, and monthly reports of receipts and expenses, and of the condition of the mine made, and kept open to the inspection of stockholders. It is by strict adherence to these rules, joined to the richness of its mine, that the Cliff mine has attained its very high position as a model company, while many other companies which started with it, though possessed of great mineral wealth have yet given no return to the stockholders. Every stockholder should also claim and have the privilege of obtaining at any time a list of the stockholders of the company in which he is interested. In these matters a full, fair, impartial statement of the formation, condition, prospects, and character of the company, and the names of its stockholders, will give intelligence always desirable to those interested, and assist in imparting stability and character to the enterprise.

Fluctuations for July* 1853 *in the Mining Stocks sold during that month at the New-York Stock and Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and Number of Shares of each sold.

Mining Stocks, New York.	Shares.	Par Value.	Highest Rates.	Day Mo.	Lowest Rates.	Day Mo.	Value July 30.	From June 30. Gain.	From June 30. Loss.	Shares Sold.
		$								
Cumberland Coal	50,000	100	49	1	38¼	28	38½	–	10	38,675
Dolly Hyde	. . .	. .	6½	29	6	28	6½	0	0	1,800
McCulloch Gold and Copper	200,000	5	7¼	23	6¼	1	7¼	–	½	18,350
Montgomery Zinc	80,000	12.50	⅝	20	½	15	½	0	0	1,600
Mineral Mining Co.	100,000	10	2½	21	2½	21	2½	0	0	100
New Jersey Zinc	. . .	. .	12½	20	11½	9	11½	-	½	8,908
New Creek Coal	200,000	10	3¼	18	2½	1	3½	0	–	16,300
North Carolina Copper	100,000	5	9½	15	9½	1	9½	0	0	100
Parker Vein Coal	80,000	100	33¼	8	20	30	23	-	10½	24,050
Pennsylvania Coal	60,000	50	119½	8	118	18	119½	0	–	860
Phœnix Gold	100,000	5	1½	8	1¼	1	1½	-	¼	1,800
Phœnix M. M.	. . .	. .	19½	28	23¼	1	20	-	4	6,215
Potomac Copper	100,000	10	1½	8	1¼	8	1½	0	0	950

BOSTON, 20*th Aug.* 1853.

Copper mining shares have well maintained their quotations in the face of a very dull and declining stock market generally, and are gradually gaining upon public confidence. Several of the mines have materially developed their

resources within a month past, so much so that disbelievers are beginning to think there may be some reality about them, while those who have had faith from the first, are quietly enjoying the profits realized from their former purchases.

Isle Royale has improved from 14 to 20 and but very little stock comes upon the market even at this comparatively high price. Their vein is said to be *fifteen* feet in width which is unparalleled in the development of any mine thus far. Ripley has gone up from $3 to $5, in consequence of the belief that they have a part of the Isle Royale vein, and considering that the company is composed of 40,000 shares, the advance is very large. Star has also gained from $2 to $4, the accounts from the mine being highly favorable. It is reported that their vein promises to be one of great value, but as yet has not been sufficiently worked to make the results a matter of certainty. Algomah has advanced from $4 to $5 and is in fair demand. The letters from this mine are encouraging. Glen sells at $3, which is an advance of about $1 per share within a month. This company was formed from a portion of the Forest Location and promises very fair.

Assessments have been laid as follows on two companies, the offices of which are in Boston.

	Amount of Assessment.	When payable.
Copper Falls, - - -	$2 per share, - - -	Sept. 1.
Native Copper, - - -	$1 per share, - - -	Sept. 22.

The usual course here is to allow 30 days for the payment of an assessment, after which the stock will be forfeited, in case of non-payment.

Native has fallen from $5 to $3, in the absence of any particularly favorable accounts from the mine, and partly in consequence of the forthcoming assessment, which is unusually large for a low-priced stock, and they always have the effect to lower the price of stock when announced.

Copper Falls has declined from 59 to 55, this being also effected by the assessment, and the considerable amount it takes to carry the stock.

Forest has fallen from 15½ to 10¾ and is heavy. This company called in an assessment of $1.70 per share on the first of July last, making the whole amount paid in $10, which is the extent allowed by their by-laws. The company is in want of more money, and a meeting of the stockholders will take place next week to consider the subject. Probably the by-laws will be so altered as to admit of farther assessments, or possibly the company may vote to sell a portion of their mineral lands, instead.

The Pittsburg Company paid a semi-annual dividend of $7.50 per share (making $15 for a year past) on the 15th instant, and the Minnesota Company will pay a dividend in Nov. next. The stock of the latter is heavy at 185 bid, 195 asked, and the Pittsburg stands 150 bid, 165 asked, ex-dividend. The large amount required for purchasing the shares in these companies renders them less subject to speculative impulses than the lower priced stocks, and the present small amount of money seeking investment prevents any improvement in market value.

In Adventure, Bohemian, Bay State, Fulton, Manassas, Manitou, Ridge, and Webster, there is very little doing and no activity.

Dana is firm at 1¾ bid, Winthrop 1½ bid, Shawmut 2 bid, Norwich 9½ bid, Phœnix 9 bid, with more buyers than sellers. National is in less demand at 30 asked. N. American 74 bid, buyers' option three months and about 72 for cash stock. N. Western is but little inquired for, at about 20.

Toltec is firm at 13 bid, which is a decline of $1½ per share from the highest point reached within a few weeks, but the chances are favorable for its further improvement, the stock being highly popular and the decline only caused by a general dulness which reigns supreme over all stocks.

Malone Sandstone has declined to 1½ bid, at which point operators appear ready to take the stock. This price is believed to be very low, and the coming Fall will undoubtedly see a material advance in the market value of the shares. The company are doing a good business, but we have nothing particular from the quarry.

West Castleton Slate is very heavy, and a sale was made last week at $3½ per share, sellers' option. Very little of the stock is offered for sale at the present ruinously low prices, and the chances are favorable for an advance when the market generally becomes active.

BOSTON MINING SHARE LIST.

Fluctuations for July, 1858, in twenty-nine different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

MINING STOCKS, BOSTON.	SHARES.	PAID IN.	HIGHEST SALES.	DAY NO.	LOWEST SALES.	DAY NO.	VALUE, JUNE 30	FROM JUNE 30. Gain.	Loss.	SHARES SOLD.
Adventure, Copper,	10,000	$10,00	—	—	—	—	5	—	1	No sale.
Algomah,	10,000	,50	—	—	—	—	4¼	¼	—	No sale.
Bay State,	20,000	,50	—	—	—	—	2	¼	—	No sale.
Bohemian,	10,000	—	4½	18	4½	29	4½	—	—	150
Copper Falls,	10,000	11,00½	61	9	56½	23	59	—	1	604
Dana,	20,000	1,12½	2½	9	*1¾	6	2	¼	—	1,048
Forest,	10,000	10,00	15½	25	*11½	14	14½	3½	—	2,244
Fulton,	100,000	2,00	2⅜	13	2	7	1¾	¼	—	900
Glen,	10,000	2,00	2½	18	2½	18	2¼	0	0	80
Isle Royale,	12,000	3,50	19	29	14¼	27	19	7	—	46
Malone, *Sandstone*,	40,000	3,00	2½	7	1½	26	1½	—	½	17,159
Manassas, Mining,	100,000	—	—	—	—	—	2½	—	¼	No sale.
Maniton, Copper,	20,000	1,00	—	—	—	—	2	0	0	No sale.
Minnesota,	8,000	22,00	205	2	200	25	200	—	5	17
National,	10,000	2,00	30	16	30	16	33	2	—	30
Native,	10,000	2,25	5	9	5	9	4	—	¼	100
North American,	10,000	17,00	70	28	70	23	72	2	—	5
Norwich,	20,000	-	—	—	—	—	9½	0	0	No sale.
North Western,	9,000	10,00	20	7	20	11	20	0	0	190
Phœnix,	10,000	5,00	11	30	9	13	11	1	—	305
Pittsburg (Cliff),	6,000	18,50	172½	11	170	9	179	7	—	6
Ridge,	10,000	—	5	20	5	20	5	—	—	100
Ripley,	40,000	2,00	3	29	2½	2	3¼	1¼	—	775
Shawmut,	20,000	,50	2	5	1¾	2	1¾	0	0	200
Star,	20,000	,50	2½	25	2¼	25	2¾	1	—	50
Toltec,	20,000	3,00	14½	18	11½	1	14	2½	—	6,028
Winthrop,	20,000	,75	2	13	1½	29	1½	½	—	635
Webster,	10,000	—	2½	16	2½	16	2	—	—	25
W. Castleton, *Slate*,	50,000	6,00	—	—	—	—	4½	—	1	No sale.

* Assessment paid.

Above, we present our usual table of fluctuations for the month of July, and it will be seen that most of the stocks stood better than at the close of the

previous month. Seven only out of the twenty-nine companies included in the Table, have lost any thing, as compared with the last day of June, and but one of those over a dollar per share. In seven different companies no sale has been made, and with two or three exceptions the amount of transactions was generally limited.

IMPORTATION OF METALS, COALS, ETC., AT THE PORT OF NEW-YORK FROM JULY 15TH, TO AUGUST 19TH, 1853.

	Quantity.	Value.
Clay	498	$ 3,214
Coal, tons	5,509	13,887
Copper, tons	2,346	43,490
" Sheathing	282	52,355
Iron, tons	5,341	321,649
" Hoop bars	8,096	16,698
" Pig, tons	7,016	118,168
" R. R. bars	58,541	444,019
" Sheet, pkgs.	17,300	62,013
Lead	38,339	177,345
Steel	4,869	116,018
Tin	24,257	210,595
Zinc	2,021	59,368
Marble	447	11,706

JOURNAL OF GOLD MINING OPERATIONS.

ANNUAL PRODUCTION OF GOLD.

The total annual production of gold, exclusive of California and Australia, at present is estimated as follows:

From the ancient Spanish colonies of America	10,400 kilogrammes.
Brazil	600
Europe and Asiatic Russia	6,200
The Indian Archipelago	4,700
Africa	14,000
	35,900–to 36 tons nearly.

GOLD YIELD ESTIMATED AT DIFFERENT PERIODS.

	1800.	1848.	1851.
America	$9,000,000	9,700,000	93,000,000
Europe	1,000,000	20,950,000	21,000,000
Asia	3,188,346	12,901,060	14,500,000
Africa &c.	2,650,000	2,610,000	3,500,000
	$15,838,346	46,161,060	132,000,000

GOLD COINED IN THE UNITED KINGDOM IN THE 50 YEARS ENDING 1850.

		Yearly Average.
In the 1st period of 40 years, ending 1840	£64,418,461	£1,610,461
" 2d " 7 " 1847	30,264,929	4,232,561
" 3d " 3 " 1850	6,121,790	2,040,596
	£100,805,180	

GOLD COINED IN THE UNITED STATES IN THE 50 YEARS ENDING 1850.

In the 1st period of	40 years,	ending	1840 -	£5,647,328	£141,188
" 2d	" 7	"	1847 -	8,158,316	1,165,188
" 3d	" 8	"	1850 -	9,824,577	3,108,192
				£23,130,221	

GOLD COINED IN FRANCE IN THE 50 YEARS ENDING 1850.

In the 1st period of	40 years,	ending	1840 -	£48,134,156	£1,085,658
" 2d	" 7	"	1847 -	3,500,000	500,000
" 3d	" 8	"	1850 -	5,726,527	1,908,841
				£53,660,682	

GOLD COINAGE AT TWO MINTS IN THE UNITED STATES FOR JUNE 1853.

	NEW ORLEANS.		PHILADELPHIA.	
	Pieces.	Value.	Pieces.	Value.
Double eagles - -	....	.....	26,474	$529,480
Eagles - - - - -	....	.....	21,777	217,770
Half eagles - - -	....	.....	51,757	258,788
Quarter eagles - - -	....	.....	330,602	826,505
Gold dollars - - -	85,000	$85,000	172,494	172,494
Total gold coinage - -	85,000	$85,000	603,104	$2,005,032

CALIFORNIA GOLD FIELDS.

A letter from Sir J. F. W. Herschel, Bart., dated Royal Mint, London, Feb. 7th, 1852, says: "It is believed that in California, gold to the value of 18 millions sterling had been found during each of the two last years; and prior to the discovery of that gold region, the whole annual produce throughout the world was supposed to be only about one fifth of that amount."

Perhaps the most careful estimate of the early product of gold from California is to be found in the semi-annual circular of Messrs. Hussey, Bond and Hale, made up to June 30th, 1852. They state the production as follows:

Received at the various mints in the United States in 1848 -		$44,177
" " " " " " in 1849 -		6,147,509
" " " " " " in 1850 -		36,074,062
" " " " " " in 1851 -		55,938,232
Manifested shipments to the U. S. in Dec. 1851, which did not reach the mint that year - - - - - - -		2,910,214
Making the whole aggregate shipped to the United States up to December 30, 1851 - - - - - - - -		$101,114,194
Shipments to Chili in 1851, by official returns -	2,372,000	
Shipments per steamers to Europe and various countries, as declared on manifests (*not including Chili.*) - - - - - - - -	3,600,000	
Other shipments not manifested, and known shipments by sailing vessels to various destinations	2,000,000	
Add estimate of shipments *via* Panama, by same course in 1851, for which destination was not declared . - - - - - - - -	1,800,000	
Total estimate of exportation to foreign countries in 1851 -		$9,772,000
The early foreign trade to this country was very large in 1849 and '50, from Pacific ports, the remittances were made chiefly in gold dust. The aggregate shipments to foreign countries for 1848, 1849, 1850, is therefore assumed to be as large as that of 1851. It is therefore estimated at -		9,772,000

Total estimates to foreign countries to December 31, 1851, which would not reach U. S. Mints - - - - -	$19,554,000
Grand Total - - - - - - . . - - -	$120,658,194
Estimated amount taken overland to Mexico, and by passengers to Europe and other countries, exclusive of Chili and the United States, 5 per cent. on the above - - -	6,032,909
In hands of bankers and merchants in San Francisco, December 31, 1851 - - - - - - - - - - - -	5,000,000
In hands of bankers and traders in other parts of California, December 31, 1851 - - - - - - - - - -	2,500,000
Estimated yield of the mines, not brought forward, December 31, 1851, say - - - - - - - - - - -	2,500,000
Circulation of California, estimated at $20 per head on population, December 31, 1851 - - - - - - -	4,240,000
Total estimate of the whole production of the mines to December 31, 1851 - - - - - - - - - -	$140,931,103
The estimated product to June 30, 1852, is stated to have been	33,849,774
The bullion on hand June 30, 1852 in California, is estimated at the same amount as that assumed to be on hand, December 31, 1851. -	
The estimated product from June 30, to December 31, 1852. is estimated the same as the first six months of this season	33,849,774
Estimating the entire product of 1852 at - - - -	$67,699,548

The returns of the census of 1852 present the following particulars respecting quartz-crushing mills :—In Butler county, 15 mills. In Calaveras county, number of mills is not stated, but the capital employed was - - - $472,555 Klamath county, capital employed - - - - - - - - - - - - 9,255.

In Mariposa county, the return was made in these words :—"Gold in abundance—six mills in operation and many erecting, all paying well. Five hundred and twenty-two quartz veins legally located and many more known to exist."

Nevada county—33 mills and capital invested - - - - - - - $3,385,426 and in placer mining a capital invested of - - - - - - - - - $894,450

Placer and El Dorado counties make no returns. Shasta county, 2 quartz mills. Tuolumne, 2 quartz mills. Several other counties contain valuable veins, but no mills were erected.—Total, 72 quartz mills, with an aggregate capital, if estimated in the ratio of Nevada county, of nearly $7,000,000.—Many of these mills have doubtless proved totally unfit for the purpose for which they were designed.

The Mokelumne Hill canal is thus described by a writer from that region :—

This ditch is a great undertaking, and is already in a state far advanced towards completion. I was informed by the president of the company, that when completed to Mokelumne Hill, it will be 18¾ miles in length. It is flumed all the way; the flume is 40 inches wide, and 22 inches high. The grade from the South Fork of the Mokelumne for 14 miles is 15 feet to the mile, and the balance of the way 6 feet to the mile. For the last four miles the flume will be 5 feet high and 2 feet wide. The estimated cost when completed to the hill is $250,000. Far up towards the head of the canal the company have a saw-mill, which turns out 15,000 feet of lumber daily. The lumber after it is sawed is floated down to where it is required in the canal, and taken out and used; saving all hauling. The canal is to be continued 18 miles farther west from Mokelumne Hill, running through a rich mining country.

The deep diggings in the vicinity of Mokelumne Hill have been celebrated

as among the richest of California. They have always been worked at a great disadvantage however, owing to the lack of water, but now they will all be re-worked clean to the bed rock. They have already commenced the sale of water, and in a week or two expect to receive very large dividends for the stockholders.

I have examined personally a good part of this work, and passed through a tunnel 300 feet in length, which has been cut through a hill, and the canal taken through it.

The Sovora Tunnel Company is organized under a charter granted by the City of Sonora, which gives the company the right of tunnelling about two-thirds the length of the town under the streets.

In El Dorado county, at Murderer's Bar, the operations of a small company are thus described:—

The claims have been so good at this place that at a meeting of the stockholders last fall, after their flume and dam had been carried away, it was resolved that a dam and flume should be constructed this spring and summer which should last for years. Accordingly a contract was given out for a race or flume to be cut through the solid limestone upon the easterly bank of the stream. This race, which has been cut through, is thirty-six feet wide at the mouth and six feet high, fall one foot to each hundred feet the whole distance, which is five hundred and fifty feet, and will carry all the water which can enter the mouth which would be about three times as much as is now in the stream. The whole race is well timbered with bed-pieces and stanchions three feet apart, and is to be planked in order the better to facilitate the progress of the water through it.

The dam, which is now in process of construction and nearly one-half completed, is made as nearly as possible in the shape of a figure 4, of framed timber, the mud sills being on the bed rock, the whole of which, from top to bottom, is to be filled with stone, and covered on the upper and lower sides with plank. The planks are to reach the bed rock, and then clay is to be thrown in to prevent the possibility of leakage. This dam and flume, it is believed by judges, will stand all the pressure of the highest freshet unmoved, and are said to be the best works of the kind as yet erected in this country. Their whole cost will be not far from $22,000.

Respecting the value of quartz veins and flumes, we have the following statement:—

The best proofs of fast returning confidence in these richest of the resources of the State, is found in the large amounts of foreign and home capital that are now seeking investment in them, showing most clearly that the denouncements that have been piled upon them, were based upon false premises, and are so considered abroad. Although there are but few, comparatively, of these veins now worked, yet they cannot be purchased from the original holders for any thing like moderate prices; and those that are in second hands are equally firm.

Two years since, the opinion was entertained that the placers were entirely exhausted; but this arose from the circumstance that the means of extracting the gold they contained were inadequate to this end, and it may not be generally understood by our eastern friends that about three-fourths of the exports of 1852, and thus far of 1853, have been taken from those sections that, prior to 1852, were deserted districts, and were considered to have been entirely exhausted. This has been directly the result of improved methods of working alone, and the amounts that will be realized from this one source, for the current year, will not fall short of forty-one millions in the aggregate. This estimate is formed on the number of miners at work in these old placer districts and the average wages which are realized under the present improved system of operating.

Another point of great practical importance which presents itself under these circumstances, and has been heretofore overlooked, is the fact, that upon

an average the quantity of ground which becomes available for mining purposes under the present methods in use, is about eleven times greater than was formerly supposed to be of value; and the receipts of the miner, though not so enormous as in '40 and '50, are highly remunerative, and extend to a much greater number of persons. It is confidently believed by those conversant with mining facilities, and the number of men engaged, that we shall during 1853 export an amount of gold much heavier than has been realized in any previous year since its discovery in this country.

Added to the above, the new mining grounds that have been discovered within the preceding six months, have been found to extend over an extensive area, nearly equalling the entire district that was formerly known to contain gold; but there are but small portions of these recently discovered districts, however, that can be made available until another year, from the want of sufficient water to conduct mining operations, they being situated in elevated districts in which water flows but a small portion of the season; but already these points have been tapped in various places, and the plough, shovel and saw, are brought into action in the construction of canals for the conveyance of water at a future day.

Since the month of April an extensive placer range has been developed, forty-six miles in length with an average breadth of about four miles, and is situated for the most part within eighteen miles of the summit ridge of mountains. This district alone is capable of giving employment to about twenty-five thousand men, as soon as the conveniences of water are obtainable.

At the distance of nine miles west of the above is a similar section, which heretofore has been but partially occupied, but at the present time several large aqueducts are in process of construction, and others completed; and it is a remarkable fact, that where an ample supply of water has been obtained from these sources, enormous amounts of gold are daily taken out, and in districts where formerly no suspicion of its presence existed.

In addition we may state also, that at the extreme north, in a course nearly northwest from the Feather to beyond the Klamath, extensive and valuable mining sections have been opened, and from the developments thus far made, they are but little, if any, inferior to the sections that have preceded them. The entire district, from the Pitt River north on both sides of the Sacramento, is now known to be auriferous, and a belt of country averaging four miles in width, and forming the eastern border of the two great valleys, is known to contain profitable quantities of gold.

AUSTRALIAN GOLD FIELDS.

The gold fields discovered in Australia stretch over 1000 miles, in a south-eastwardly direction, from Moreton district to Ballarat.

PURITY OF AUSTRALIAN GOLD.

The Annual Address delivered before the Chamber of Commerce at Melbourne in April last, contains the following statement :—

Nearly all the gold that is found in the adjacent colony appears to have proved inferior in quality to that of Victoria, to the extent of from 1*s.* to upwards of 3*s.* per ounce. The qualities of the Victoria gold are not generally understood to vary so considerably, although reports are prevalent of differences in gold from different localities to the extent of 3*s.* per ounce. The purest specimens hereto found are from the Ballarat gold fields, where the quality approaches 23½ carats, an exceedingly rare purity for gold in the native state. The quality of the Mount Alexander and Bendigo gold is usually 23¼ carats fine.

The statements of this Address are of such a reliable character, that we in-

sert in these pages so much as relates to the gold fields in the colony of Victoria :—

Our previous address, delivered twelve months ago, left the busy gold-diggers, to the number of about 50,000 persons, located chiefly around Mount Alexander. A small number still adhered to Ballarat, the first gold field of any importance that had been worked in the colony ; but the great proportion of the mining population lined the hollows of the Forest and Fryer's creeks, at a distance of several miles to the southward and westward of the far-famed Mount. The dryness of the season, usual at that time of the year, and the consequent scarcity of water for washing purposes, had greatly restricted the yield of gold as compared with the numbers engaged. In many instances the auriferous earth was conveyed in carts to a distance of several miles for water.

The ambitious, the discontented, and the unlucky were alike on the outlook for better things. The belief gradually impressed upon our colonists, that the entire country in that locality was one vast gold field, stimulated farther research. The similarity in the general landscape features favored this impression. There was ever recurring the same hard, dry surface, favorably impressing the wayfarer by the excellence of the natural road. There was the same reddish soil, with a grassy undulating country, and an open forest having a conspicuous predominance of red gum-trees. But, above all, there was the hope-inspiring quartz gravel, found either at or near the surface, or in the immediate vicinity of spots that exhibited "denudation" symptoms, indicative of the gravel having once been there, and having possibly left behind it the gold with which it has been so generally found charged.

In April, the valley of the Bendigo Creek, about twenty-five miles to the north of Mount Alexander, began to acquire celebrity; and in the following month, thousands of persons who had hurried forward from various parts, appeared at the new diggings. The autumn rains had now began to afford some supply of water, and the general success at Bendigo soon very sensibly affected the quantities of gold brought into town from thence and from Mount Alexander by the weekly armed escorts. In May this quantity amounted to 76,000 ounces; and in June to 115,000, but in July it rose to 320,000 ounces.

For several months the Bendigo gold fields maintained an undisputed position of primary importance, and are probably, even now, the most productive, although less in vogue than formerly. The reputation of Bendigo was at its height during the month of June. The road from Mount Alexander at this time was represented as one continuous line of vehicles and passengers. The masses of population, estimated, probably with some exaggeration, at 40,000 souls, spread themselves into the adjacent gullies and creek beds, to each of which they applied some significant or fanciful appellation.

The great distance from markets, and the bad condition, generally, of the roads during winter, raised the prices of all provisions and other necessaries at Bendigo, to enormous rates. The carriage of provisions and other necessaries rose to upwards of £100 per ton, or £1 per ton per mile; and it was estimated that the cost of the mere carriage of supplies for Bendigo and Mount Alexander, for the six months of the winter season, would not fall short of that of the construction of a railway for the entire line. The following is a comparative statement of some of these prices, and of the concurrent rates for the same articles in the Melbourne market. With a return of summer, and a good condition of the roads, supplies have since been more abundant, and prices much reduced; but approaching winter may probably renew these high rates.

	Bendigo.			Melbourne.		
Oats per bushel - - - -	£1	13	0	£0	7	6
Flour, bag of 200 lbs. - -	16	0	0	2	10	0
Bran per bushel - - - - -	0	16	0	0	2	3
Sugar per lb. - - - - -	0	1	4	0	0	3
Tea do. - - - - -	0	4	6	0	1	6

		Bendigo.	Melbourne.
Butter per lb.	- - - -	£0 5 0	£0 2 0
Cheese do.	- - - - -	0 4 6	0 2 0
Tobacco do.	- - - - -	0 12 0	0 6 0

But these fitful masses moved with every breeze. The rumors from Mount Korong further north, and from Daisy Hill to the westward, detached some portion of the crowd. The reputation of Forest Creek gradually revived by the opening of some richer branch diggings. More recently, the gold field around the township of Wangaratta, and in the vicinity of the River Ovens, in the direction of the main road to Sydney, have excited general attention. A large body of diggers is already at work in this locality, and the produce is so considerable, as to have induced the establishment of an escort party from Sydney, for the conveyance of the produce direct to the market. Within the last two months, however, the reputation of Balaarat has suddenly revived, and almost ecliped that of the other localities, by the marked increase of its produce, and by the discovery of several masses of pure gold of unprecedented dimensions.

Our mines generally have been remarkable for the production of these solid masses, with exception, however, of the Ovens gold-fields, whose produce contrasts strikingly in the smallness of its grain, with that of the other mining localities. The masses, the *pepitas* of the Spaniards, or the *nugget*, according to our style, are rarely found, in other countries, of those large dimensions that are now quite familiar to the miners of this Colony.

GOLD MINES IN PERU.

An expedition was about to be fitted out in May, to enter the territory of the Chanchos Indians, under a General O'Brien, who, in 1834 and 1835, discovered three veins in the Indian territory rich in gold. The history of O'Brien's discovery and some details connected therewith are thus reported:—

General O'Brien, the companion of Gen. San Martin in the battles of Chacabuco and Maipu, after residing many years in South America, employed in the service of the cause of independence, returned to Ireland, his native land. Unable with his restless disposition to remain in quiet, he embarked a second time in 1828, for Brazil, accompanied by his countryman, Mr. Edward Oxenford, the celebrated mineralogist.

"Very shortly after their arrival at Rio Janeiro, they started out on scientific researches, and travelled over great districts in the Valley of the Amazon, inhabited only by the savage and wild beast. The Indians all agreed that there were many mountains rich in gold in the territories of Paucartambo, Cuzco and Los Yungos. These mines were in the possession of the Chuncos Indians. O'Brien, resolved on the exploration, went to Cuzco in 1834, took an interpreter, two servants, and a number of articles suitable for the Indian trade. His ostensible object was only to collect specimens of strange birds and animals. He was received with great friendliness by the Indians. For four months and a half O'Brien was gone, and nothing was heard of him until he returned with the proofs of his great discovery. The specimens he brought were a number of nuggets and two bags (*alfarjas*) of sand from the rivers Ninto, Milagro, and Erin's Golden River, a name which the discoverer gave the stream in honor of his native country. Don Diego Smith, the English assayer in Cuzco, examined these specimens. One nugget weighing 18 ounces, while the sand of one *alforja* produced $18, and the other $14. General O'Brien had travelled up and down the banks of each of these rivers, the distance of 200 miles, and found the gold in flakes the whole distance. Some of the readers will perhaps remember the celebrated lawsuit in England against Sir Peter Laurie, magistrate of London, for having disfigured the profile of the statue of the Duke of Wellington, made of a nugget of gold weighing 18 ounces. This nugget now exists in Dublin, and bears on its inscription, "found in Paucartambo, in 1834."

O'Brien had the results and details of his discoveries recorded in the Mint of Cuzco. General Gamarra, who then governed the Peruvian Republic, agreed to give him two hundred men and four pieces of artillery, to make another expedition, and the latter bound himself to pay all the debts of the Government within a fixed term of years; but before any thing could be done the war of the confederation with Bolivia happened, and all their projects were overturned.

But now a new era has arisen for Peru. Five years more and those plains now unknown will be open to civilization, and millions of inhabitants will explore their inexhaustible wealth.

Already President Echenique has made a contract for the construction in the United States of two large steamers to navigate the Amazon, and connect directly the valleys of Cuzco, Carrovalla, Paucartambo and Huanico with the Atlantic, and through them export their Alpaca wool, bark, fine and rare wood, gutta percha, and other valuable products which are now not cultivated on account of the great distance and the roughness of the roads to Callao. Islai and Arica.

GOLD IN OREGON.

Respecting the discoveries of gold in Oregon, the *Oregonian* makes this statement:—

By information received from persons who have visited the head waters of the Santiam, we are led to the conclusion that gold exists in that region in considerable quantities. Some men who have been prospecting have made as high as $4 per day, by pan washing. The stories afloat as to the amount of gold found, are undoubtedly much exaggerated. Our advice, if it is worth any thing, to all is: remain at home, cultivate your fields, attend to your workshops, and let others dig the gold.

GOLD IN NEW GRENADA.

All the gold at present furnished by New Grenada is the product of washings established in alluvial grounds. The gold exists in spangles and grains, disseminated among fragments of greenstone and porphyry. At Choco, with the gold and platinum, hyacinths, zircons and titanium occur. There have been found also, in the auriferous localities, large trunks of petrified trees. The gold of Antioquia is 20 carats fine; that of Choco 21; that of Giron is of 23½ carats, being the purest from America. "For those who traffic in gold," says Humboldt, "it is sufficient to learn the place where the metal has been collected to know its title."

Accounts from the Isthmus as late as August 1st, furnish the following particulars:—

The visit to our city of Aspinwall of three different parties engaged in gold mining at various points on the Isthmus, as also of one which is working a coal mine at Bocas del Toro, a short distance down the coast, has excited a lively interest. Among the items that we have gathered, is the fact, that there are a number of parties preparing to work, and in some instances working mines in this and the adjoining provinces, whose operations are unknown to the public.

An English Company has bought a gold mine on the river Barbara, a tributary of the river Atrato, and is now preparing to work it.

Two native Agents are employed by English Companies to buy land and mines in the provinces of Choco and Antioquia.

There is an English Company working a gold mine in the vicinity of Buenaventura, on the Pacific coast.

An English Company has bought a gold mine in Antioquia, for one hundred and fifty thousand dollars, and is now working it.

An American Company has passed through Carthagena for Choco lately, whose object is to search for gold mines in Choco and Antioquia.

It is said a coal mine has been discovered on the Rio Leon at the mouth of the Atrato, in the gulf of Darien. Some scientific men started from Carthagena about the 20th July last, to test the truth of this matter,—the gentlemen are Americans.

A surveying party has also passed through Carthagena, for the head waters of the Atrato, to survey Blag's route from the river Quito to the San Pablo.

HOW THE GREAT GOLD NUGGET WAS FOUND.

The following narrative is given in the *Manchester* (England) *Guardian* as the version of one of the diggers who found the monster nugget of 134 lbs. 11 oz. at Ballarat. The account runs thus:

My cousin John Evans, and myself, left England for Melbourne on the 2d of June, 1852, by the Lady Head. We have both worked in coal mines, I was a sinker; and we thought if gold was to be had, we could get it. We had a good passage out, arriving in 83 days. We found hundreds of people without shelter; many lay in the streets, and many in the watch-houses. We found out a fellow townsman, and he let us sleep on the floor of his kitchen. We didn't stay long there; just enough to see about. Things were very high then, but the diggers spent money like dirt. Almost the first man we met on shore was drunk, and swore he'd spend £500 before he left the spot. We saw the man who found the big nugget. He was drunk, too, on horseback, and shouted out "I'm the boy who sold the nugget for £4000." They told us he was always drunk since he found it.

We bought a blanket, tent, and some tools, chose a space (they allow you 16 feet square), and went to work. The first day we got an ounce apiece, after sinking two or three feet. This was in Sheepshead Gulley, in a clayey soil. Worked here six weeks, and got between 5 lb. and 6 lb. weight of gold, but the water began to fail us, and we suffered badly from dysentery. It's all surface water. I only saw one spring in the country. Hearing of a rush to the "Ovens" we decided to go, and it was there we were joined by our mate (Lees) and two other men. We bought a horse and cart for £84, and three months' provisions. Flour cost us £15 a sack, or 1*s*. 6*d*. a pound; salt, 2*s*. 6*d*. a pound; butter, 5*s*. 6*d*. Tea and coffee were cheap. We had to buy fire-arms and guard the horse night and day. 'Twas a dreadful journey through the bush, and it took us more than a fortnight, being as we reckoned 225 miles. When we got to Ovens, we found the diggings were 25 miles from the town. We didn't like the looks of the place; it was solid hilly ground; so we turned back and went straight to Melbourne, about 150 miles more. We sold our horse and cart here for £65; but we didn't stay long. We then concluded to try Ballarat, so we got a new rig out, and I and my cousin Lees, and a young man who came out by the Great Britain, named Green, made the party.

Green had been railway clerk in Wolverhampton; but seeing there was no call for clerks out there, he would go with us. We went by the steamer to Geelong, and then, with our blankets and rifles on our shoulders, we walked through the bush to the diggings. We had hard work here to get food. We couldn't obtain any for love or money. We had no flour or damper, no salt; and for two days we lived only on what we shot, and very awkward it was to cook it too. Ballarat is about 60 miles from Geelong, and we fixed our tents there, outside the diggings. We always liked that plan best. We then had a good look all over, which took us some days. I was out one day, and I thought I would have a look at some of the old holes, and I went down many of them between 30 and 50 feet deep. I liked the looks of two of them, and we set in to work and got about 11 lbs. of gold in about a week. We marked where the dip in the strata was, and began driving a level tunnel. The first day we got gold. We tried other holes after that. In one of them I went down I found a

pillar left for support, so we cut down some trees and made props, took the pillar away, and got more than a pound of gold out of it. Then we thought we would try two new holes, but we didn't like the looks of them we began to sink; so we deserted them, and tried the old ones again till the find began to fall short.

One morning I threw my gun on my shoulder, and started off for another ramble, and about three miles off came to a likely place called Canadian Gully. I liked the looks of this amazingly, and went back and reported. Next morning all went over with the tent, and marked out two spaces. We began two shafts, 37 inches in diameter. Cousin Jack and I dug and sunk; Green and Lees hauled and carried. We soon came to good soil, and worked away in earnest at our hole. We found gold very soon, and worked night and day; in a few days we got down 50 feet, and got 8 lb. or 9 lb. of gold. Then we had a good offer for the hole, and sold it, and set to work upon the other shaft. This was a troublesome one, for the water rose at 20 feet, but we got more timber, cut and cased the shaft, and then got rid of the water, and soon came upon the clay and gold.

About 66 feet deep we found the bottom of sandstone and slate, so we began driving a level again, and one day 'twas my turn down, and in the tunnel, about 30 inches high, and a yard wide, I found some very good nuggets, and when I came up I said to Jack, in a joke, "this is the way to get gold; you don't know how to get it." But he said "he should find some, some day;" and sure enough he had not been down long before I heard him laughing like mad and calling me. I leant over the shaft, and he could hardly speak. "What is it, Jack?" I said. "I've found it!" said he, "and it's a big'un." "Softly," I said, "for God's sake, keep quiet; how big is it?" "Three or four hundred weight," he said, laughing again; so I begged him not to make a noise, and I went and called Lees, and took him away from all the tents, and told him Jack had found a big nugget, and we must keep it dark. So I got an old sack, and sent it down the hole, and Jack soon sent up the gold; I slung it over my shoulder, and walked quiet-like through all the diggers till I came to our tent, and then I threw it down outside on the dirt heap, and went inside to consider what was best to be done.

Leaving Lees to watch, I went off to the agent's, two miles off, to ask for protection. "What for, Evans?" "We've found a large nugget, sir." "How big," he says, "forty pounds?" "Well, sir," I said, "I think it's twice forty." Oh! you're romancing," he says; but he sends three police and a horseman, and just at sunset they slung the sack on a pole and carried it off to the government station. It was soon all over the diggings, and one man bid up £250 for the hole; but we wanted £300. Next morning we went to the commissioners to get the nugget washed and weighed, but it was licence day (every body has to take a licence at the diggings—visitors and all), and there was such a crowd of people that we left off washing it; and when they all went away we weighed it in an old pair of potato scales, and it weighed 134 lb. 8 oz. or 111 lb. avoirdupois. While we were at the agents, we told our mates, Green and Lees, to sell the hole, and some Lancashire folks offered £300 if they'd let 'em try it first.

So one of 'em, went down, and in the second basket of mud they sent up another nugget, which weighed 55 oz. 10 pennyweights, but they didn't know it was there; and when Lees told 'em they closed the bargain; and sent no more buckets up. The commissioners advised us to leave the place as soon as we could, there was a great excitement about it; and as we went through the diggings they told us our mates had found another big nugget, but we didn't believe 'em, there's always so many romances flying about there; but we found 'twas true this time. Getting a receipt for the gold, we set off for Melbourne, but found the news had gone before, and one gentleman offered us on the Geelong boat £5 an ounce for the big nugget, if 'twas half stone, but we wouldn't sell it. So waiting for the escort, we embarked with all the gold we had on board the Sarah Sands, and after a long passage landed at Plymouth (the ship

carried six tons in all, and at last saw it safely housed in the bullion office of the bank of England.

[By the last arrivals from Australia we learn the Ballarat nugget has been eclipsed by a more brilliant discovery, namely, the finding of two enormous masses of gold in quartz, weighing upwards of 186 lb. 11 oz. 10 dwt. troy.]

GARDNER'S MAGNETIC GOLD WASHER.

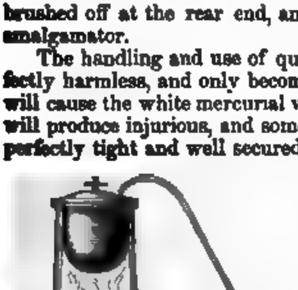
The method by which this separator and amalgamator is used, is as follows:—

In the first place, a suitable spot contiguous to the auriferous earth, or gold-bearing pulverized quartz, is selected, near to water, if possible; the machine properly put together, and if mercury is used, the furnace K, adjusted under the amalgamator J, and the smoke-pipe attached.

Accompanying each machine are three sieves, adapted to different kinds of earth; the cast-iron sieve is best for coarse or clay diggings, and the finer ones for sand or pulverized quartz rock. Adjust the sieve in the rocker B, kindle a fire in the furnace K, (if mercury is used,) put in a small amount of water, and pour the quicksilver into the amalgamator J, and when the water is raised to about one hundred and fifty degrees temperature, or a little more than blood heat, the mercury and machine is ready for operation.

Shovel the earth into the rocker, and at the same time conduct in a stream of water if practicable; if not, pour in gradually with a bucket, turn the machine steadily. not too fast, and all the soluble earth, clay, and a large part of the white or gray sand will pass off with the water at the side of the machine, and the black sand or oxide of iron will be removed by the magnets and brushed off at the rear end, and the gold be detained in the bottom of the amalgamator.

The handling and use of quicksilver requires care, but when cold, it is perfectly harmless, and only becomes injurious when heated to such a degree as will cause the white mercurial vapor to rise from the surface; which, if inhaled, will produce injurious, and sometimes fatal results, and hence the necessity of a perfectly tight and well secured retorting apparatus.



In using the Retort, put in the amalgam, after all the liquid mercury has been pressed out through buckskin. See that the edge, or place where the cover rests is free from dust or sand, that the joint may be perfectly tight; screw down the cover, and let the lower end of the pipe dip into a bowl of cold water. Put in the pipe firmly, place the retort over a coal or wood fire, as represented in the cut, and heat it *quite gradually* until red hot (if heated too suddenly, the vapor will form faster than the pipe can carry it off), and the great pressure will loosen the pipe, resulting in loss of mercury. The cold water in the bowl will condense the

mercurial vapor, restoring it to its natural state—quicksilver; and in this way it may be distilled thousands of times, without material loss, or injury to the operator.

After the mercury is all expelled from the amalgam, remove the fire or the retort, allow it to cool, and if the quicksilver is all expelled, the gold will appear of a natural gold color, and is then ready for market or melting.

NEWTON'S GOLD WASHER.

This late English invention relates to a mode of subjecting pulverized ores to the combined action of water and quicksilver, for the purpose of amalgamating the metallic particles thereof with the quicksilver, and of driving off the earthy and other refuse matters.

Fig. 1.

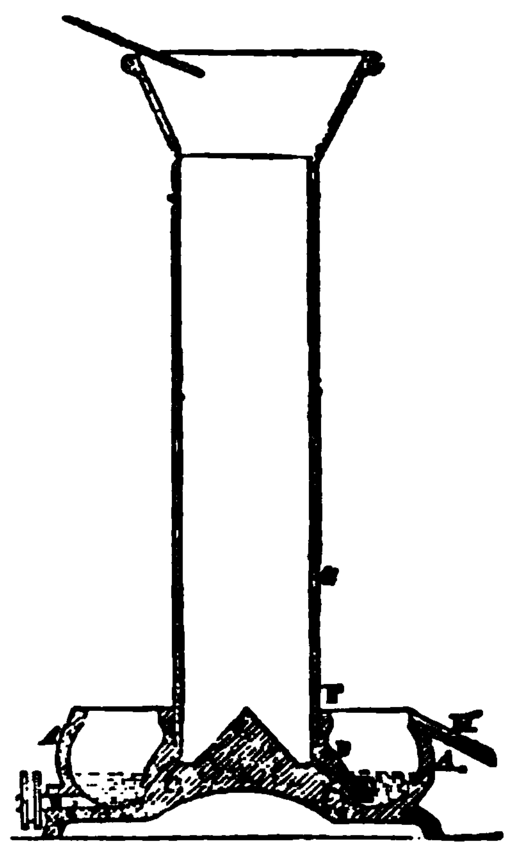


Fig. 2.

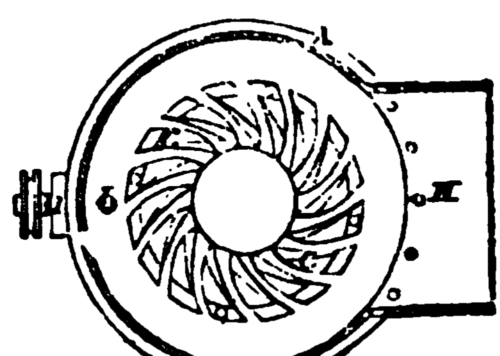


Fig. 1 is a vertical section of the apparatus employed by the inventor for the purpose; and fig. 2 is a plan view, with the vertical water and feed-pipe and conical cap removed. A, is a circular vessel for containing mercury, and provided with a rising conical bottom. On the surface of this conical bottom numerous curved grooves C, C, are formed, through which the water and pulverized ore are passed into the quicksilver. These grooves are covered with a hollow cap D, screwed firmly down through its flange E, and having a hole F, in its top, to receive the feed-pipe G, which fits in tightly, and is high enough to contain a column of water sufficient to force its way, with the pulverized ore, through the said grooves and the quicksilver in the vessel A, and pass off through the discharge-spout H. The mercury vessel is provided with an outlet I, for discharging the amalgam as often as may be necessary.

The operation of the apparatus is as follows:—The pulverized ore is placed on a sieve at the top of the feed-pipe G, and a constant stream of water is applied thereto; whereby the fine gold or other metallic matter is washed through the meshes of the sieve, and down the pipe into the diffusing grooves C, C; the pipe being meanwhile filled to a height sufficient to countervail the resistance of the heavy body of quicksilver, and force the metallic matter through the grooves at the bottom of the vessel A, into the mass of quicksilver. By this means the metallic particles become thoroughly mixed with the quicksilver, and the water and other light matter, rising up to the edge of the mercury vessel, pass off through the discharge-spout H; while the gold or other metal is taken up by, and amalgamated with the quicksilver. This amalgam is drawn off as often as it may be necessary, by removing the plug from the outlet-pipe I; and a fresh supply of mercury is then placed in the vessel A, ready for the next operation.

BUFFUM'S AMALGAMATOR.

Improved Gold-Washer and Amalgamator. Patented May 31st, 1853.
ARNOLD BUFFUM, New-York City.

The figure annexed represents the gold-washer; 1 2 3 4 are centrifugal amalgamating compartments; 5 is a centripetal discharging compartment; 6 7 8 9 are agitators. The discharging aperture is in the centre of the bottom

of the centripetal compartment at 12, surrounded by a conical inclined plane. A series of circular channels, within one another, surround the conical inclined plane and connecting with each other by openings; they are about two inches high; above is a revolving guiding table 10, which brings the ore in close contact with the quicksilver.

The bottom of the amalgamator is covered with quicksilver; the water and ore are introduced at 1, when it is agitated by the revolving wheel or agitator 6, which washes the ore and moves it through the connecting opening direct upon the surface of the quicksilver; when it has passed through 2 3 4, and it arrives at the compartment 5, the centripetal force carries the impurities circularly in the channels through the aperture 12, when the inclined plane prevents the escape of the quicksilver.

"1st. I claim the furnishing of the centripetal discharging compartment, with a horizontally revolving, water-moving and ore-guiding table, in combination with a discharging aperture, surrounded by a conical inclined plane at the centre.

"2d. I claim the arrangement of the circular guiding channels, with connecting openings, so adjusted as to secure an irregular spiral passage from the periphery to the aperture at the centre. I claim these arrangements for gold separators, whether the centrifugal and centripetal compartments be used in combination, or either of them separately."

BERDAN'S CRUSHER AND AMALGAMATOR.

We are indebted to our friends of that valuable publication "The American Polytechnic," for the opportunity of laying before our readers the preceding and following illustration of recently patented Quartz Crushers and Amalgamators.

Improvement in Machines for Pulverizing Auriferous Quartz and Amalgamating the Gold. Patented May 24th, 1853. Hiram Berdan, of New-York city.

The nature of this invention consists in attaching, by a pin or axle, a box and sieve as seen in the figure at S, a ball or sphere, X, of three thousand or more pounds weight, to the inclined shaft B of an inclined vase or bowl A whose axis inclines a few degrees from a perpendicular, which ball or sphere is so fastened to the axis of the bowl as to have a combined rotary or spiral motion, by the turning of the said bowl upon its inclined axis, which may be effected by horse or any convenient power applied to gearing, which makes into the cogs on the periphery of the bowl at Y. This basin A is furnished with a proper supply of quicksilver, serving also as an amalgamator; the finely-pulverized gold is returned, while the earthy matters pass off with the stream of water flowing into the bowl

and out of it, through openings T in its sides. The ball, or grinding sphere, is solid, or may be made hollow, so as to be easily transported; and, if hollow, is weighted with lead or sand, or any other heavy material, at the mines when it is to be used; the basin, which acts as an endless inclined plane, being turned upon its axis with a comparatively small amount of power, the ball in the mean time revolving continually, and by its own gravity keeping in the lower portion of the bowl, rolling over and twisting, and thus crushing and grinding the quartz successively presented to it by the continued rotation of the basin. This invention further consists in connecting with the bowl or basin a heating or fire-chamber, divided into four partitions P, with grate F, which chamber revolves with the bowl or basin.

"I claim—1st, Attaching the ball or sphere obliquely to the inclined shaft, by the pin-box and sleeve, substantially as described, in combination with the inclined shaft and inclined bowl, as herein set forth.

"2d, In connection with said bowl, I claim the heating-chamber or furnace, arranged, constructed, and operating in the manner and for the purposes herein specified.

JOURNAL OF COPPER MINING OPERATIONS.

Produce of the Copper Mines of Cornwall since 1845.

Years.	Ore in tons.	Copper in tons.	Money value.
1845	162,557	12,883	£919,934 6
1846	150,431	11,851	796,182 6
1847	155,985	12,754	889,287 0
1848	147,701	12,422	720,090 0
1849	146,326	11,683	763.614 0
1850	155,025	12,254	840,410 0

Quantity of Copper produced in the several districts of Great Britain and Ireland.

With ores from	1828. Tons.	1829. Tons.	1830. Tons.	1831. Tons.	1832. Tons.
Cornwall, ...	1966	9763	10,890	12.218	12,099
Devonshire, ...	434	318	368	312	249
Other parts of England, . . .	71	36	10	31	42
Anglesea, ...	738	901	815	809	852
Other parts of Wales, ...	259	172	237	123	237
Ireland, ...	706	790	768	972	974
Isle of Man, ...	—	4	9	15	12
Total copper from ores of United Kingdom, ... ,	12,169	11,994	13,097	14,480	14,465
" smelted from foreign ores, .	—	30	124	100	56
General total, ...	12,169	12,024	13,221	14,580	14,521

NORTH CAROLINA COPPER COMPANY.

The semi-annual Report of this successful company, states many important particulars respecting the operations of the mine.

This company was organized in January last, solely for the production of copper, but did not commence operations until March. During the interval since March, a period of four months, they have taken out 1,500 barrels of ore,

weighing 800 lbs. each, of which one-third was sold to the Revere Works, Boston, and the remainder is in transitu to this city. Apart from the production of ores, this company have made the most liberal improvements for the development of the several veins on their property, and, instead of assessing the stockholders for money to conduct their operations, they have from the sales of ores paid their way, and have now an unemployed surplus in the treasury, besides paying for new machinery, &c. This machinery will immediately be made available towards working the veins on a more extended scale, when the supply of ore will be more than quadrupled.

The quantity ready for blasting out is inexhaustible, whilst on the surface there are several hundred tons waiting to be crushed or dressed. At present the miners are taking out six tons daily, equal to about fifteen barrels of No. 1 ore. This small quantity will bring to the treasury a sum sufficient, with what is on the way, and the ores already sold, for a large dividend; say, by the 1st September next. The second half year's business will be much increased, as the company will be in successful operation with its new machinery, and more perfect arrangements in regard to the transportation of its ores. The machinery sent down will be completed for working by the 1st of August.

With regard to the supply there can be no doubt. A geological examination of the workable veins was made by Professor Jackson, on the 25th and 26th April last; but since then, the large vein in the whym shaft has increased from six to fourteen feet in thickness; the lower part being exceedingly rich in clear copper pyrites, and full seven feet wide. This part of the vein has increased from 16½ inches to seven feet, since Dr. Jackson's report. The ore taken out requires no dressing, and from the width (being constantly on the increase,) the company look forward to it as the most profitable vein on their property. It is estimated, from measurement, that at least 10,000 tons of No. 1 ore, that will yield 30 per cent. and more of pure copper, could be taken out of the lower part of this vein within the next twelve months. The new shaft which is being opened is designed to cut this rich vein at a depth of 200 to 250 feet, according to its dip. On the upper side of the lode in the whym shaft, there is a rich quartz vein, now measuring eight feet in thickness, capable of producing 6000 tons per annum of ore that will require more or less dressing, and will yield when dressed 25 parts copper. The productive capacity of these two veins can be increased, as soon as there is stoping ground sufficient for miners to work.

From the other shafts very little ore has been taken out, owing to the want of machinery to drain, and room to work; but can be wrought profitably as soon as the engine is up with the hoisting apparatus, so as to clear away as fast as the blasts are put in.

The shaft A, which is fifty-six feet from the whym shaft, has several veins, all converging towards the main vein in the whym shaft, capable of yielding 4000 tons of 30 per cent. ore annually. The shaft C, which cuts the outcrops of the upper vein of shaft A, discloses the main vein at a surface distance of 310 feet. The vein at this point is also capable of yielding 4000 tons annually of a similar quality of ore.

From the company's experience thus far, it is quite certain that the whole course of the main vein (1810 feet), contains an inexhaustible supply of this rich mineral, it having been proven for a distance of 668 feet, in a southwesterly direction, and it is not unlikely that new veins may be discovered. The question, then, as to the mine holding out, may be regarded as settled. The estimates of the different veins will be found rather under, than over, their true capacity. It is by no means expected that the company will work the several veins to the full extent of their productiveness; so large a supply would at once be felt in the price of copper ores.

As has been before said, the average daily yield, at present, is six tons of No. 1 ore; this, it must be remembered, is in fact nothing but the blastings, while preparing the the mine for more extended operations, for it may be said

that no strenuous efforts are making towards working for an additional supply. Until the engine draining and lifting apparatus, and machinery for crushing, are in operation, most of the mining force will be employed in the engine shaft, in order to be prepared for the engine and machinery.

Out of sixty first-class miners, not more than eight are regularly employed in underground work, for want of room and power to lift. The other forces consist of forty second class miners, and from forty to fifty laborers and boys—in all one hundred and fifty—hands enough, with the new machinery, to take out and prepare for market fifty tons of No. 1 ore daily.

The annexed table, showing the profitable results of copper mining from pyritiferous ores, commencing with six tons per day (the daily production of this mine with a few hands, assisted by rude machinery driven by horse power), and increasing the daily yield to fifty tons, the maximum estimate of the company, allowing three hundred and thirteen working days to the year, will form some idea of the prospects of this company.

Production		Expenses of Co., and	Annual Dividends at
Tons per day.	Tons per annum.	Cost of Mining.	$150 per ton.
6	1,878	31,700	50 per cent.
10	3,130	52,800	80 "
15	4,695	81,300	120 "
20	6,260	105,600	160 "
25	7,825	134,000	200 "
30	9,390	168,400	240 "
40	15,520	212,000	320 "
50	18,656	268,000	400 "

The mine is situated in Guilford county, about nine miles from Greensboro, and eight from the plank road leading to Fayetteville, distance seventy miles.

This road is convenient for hauling, whilst the Cape Fear river being navigable for steamboats to Fayetteville, enables the company to send their ores to market via Wilmington, most of the year without delay. Another season will give the company all the facilities for transportation that can be desired. The North Carolina Central Railroad, now being built from Goldsboro (midway between Wilmington and Weldon) to Charlotte, will pass through Raleigh and Greensboro. This road will give the company two routes to Portsmouth, Va. (opposite Norfolk), one by the Raleigh and Gaston and Seaboard and Roanoke Railroads, and the other by the Central road to Goldsboro, and from thence by the Wilmington and Weldon, and the Seaboard and Roanoke roads. From Norfolk there is steam communication to New-York, twice a week.

N. K. Anthony, President; E. W. Hicks, Secretary.

Directors,—N. K. Anthony, J. R. McJimsey, Albert Camman, Geo. R. Hazewell, New-York; N. L. Stith, A. B. Stith, J. T. Foster, North Carolina.

MINING IN EAST TENNESSEE.

The citizens of East Tennessee are evidently aware of the value of their mines and minerals, and are beginning to be in earnest for an immediate geological survey of their State, as is evident from the interesting statements of the following letter, written by one who has for several years been enlisted in mining operations:—

I have written nothing on the subject, but I will say to you, there is as profitable mining ground in East Tennessee, as in California, or Australia; and time and skilful research will probably show it to be more extensive than is now anticipated. I made an effort of eight years' duration, and had done but little, until some of our ores were analyzed in London. In October last a company of capitalists in that city, sent out a competent agent to examine and purchase mining lands.

The lands bought by Capt. G., who is the agent referred to, are to be paid

for in July and November. For one lot in Georgia, he has paid $40,000. Three lots in Tennessee he is to pay for in this manner. To C. M. & K. one hundred and fifty thousand dollars for 160 acres. To T. I. W. D., seventy-five thousand dollars, for 160 acres, not opened. To D., thirty thousand dollars, for a lot not opened. Both of these last lots present good evidence on the surface. A few years since the lands were entered at from 50 cents down to one cent per acre, and when I went to Ducktown, three years ago, no quarter section in the township, however well improved, was reported to the revenue commissioner for more than $500, and a great deal of it, for less than half that amount. In the winter of '49 '50, while at Nashville, I obtained the pledge of a law giving all the revenue that will be derived from mineral lands, as they are developed, to the school fund. And I am happy to say to you, that the revenue from half a million will be collected next year from one township in the State.

I have referred to this subject, intending to ask your co-operation in a work, which I am conscious is of equal importance with any subject that will occupy the attention of the next Legislature. The proposed work is a survey and thorough examination of East Tennessee, with a view to arrive at correct conclusions with respect to its mineral wealth.

The openings for copper ore, properly speaking, are at the terminus of the Smoky Mountain range. The veins, or leads for copper, seem to run parallel with the mountain, and some incline to the opinion that copper will be found all along that line. Other metals are found combined with the copper, viz., gold, silver, lead, and zinc, but not in quantities sufficient to justify separation. The existence, however, of the variety above named, all in the same veins, or leads, adds to the value of the country, as a mining country, in more respects than one. In the first place, one mineral, or metal, operates, as a flux upon another in melting. But again, the existence or presence of the variety above indicated, at any given point in a metalliferous range, at least give ground to expect that amid all the diversity of formation found in a distance of fifty or a hundred miles, in one formation at least copper may predominate, and in another a different metal may be expected. The State, unquestionably, owes it to herself and to her citizens to have a common scientific survey made.

The mining capitalists of the old world are ready to make unlimited investments here, if we can furnish grounds that will pay. Three hundred millions of capital employed in England in mining operations is taxed to support the crown, the nobility, the church, and the paupers, until, when the whole is footed up, twenty-eight shillings sterling is paid annually on every hundred dollars of working capital. In that country the weight of taxation, the depth of the mines, the weight of water to be raised, the exhaustible coal fields, and many others reasons, are operating powerfully to transfer the mining capital of England to the United States.

SYSTEM OF MINING OPERATIONS AT LAKE SUPERIOR.

The system adopted for the organization of the miners in the Lake Superior region is described with much minuteness of detail, in a recent number of the Detroit Advertiser. We insert in the pages of the Mining Magazine such portions as are of general interest to those engaged in extensive mining operations:—

The mining enterprises of Lake Superior, employing a large number of men, are in general of a common organization. The men are divided into "surface men" and "miners." The surface men are employed by the month, at wages averaging about one dollar per day, and do the work above ground, such as getting out timber, erecting whims and other machinery, laying railroad tracks, moving waste rock, and in doing the various kinds of necessary heavy work, incident to mining. The operations of farming, which are largely carried on by all the principal mines, are distinct from the mines, and are under the superin-

tendence of a head farmer, who receives about $45 per month, and is responsible for his branch of the work.

The miners are employed nominally by contract, and are settled with, like the surface hands, once in each month. I say they are employed nominally by contract, for the reason that these contracts are so arranged by the management of the companies that the men shall receive about $35 per month, and are of short duration, so that in case it turns out that they are for a short time making more, the difficulty may be remedied speedily. Every sixth under-ground man is a contractor; who at the expiration of his job waits upon the mining captain, and makes a bargain to excavate so many feet of shafting, drifting, cross-cutting, adit-work or stoping, at a given price per foot or fathom. He picks his men and they go to work upon the job in common, the contractor having no advantage whatever over the rest; they are charged upon the books of the company with the necessary mining supplies, viz., so much powder at 14 cents per pound; so much safety-fuse, at $2,50 per coil of 500 feet; so many tallow candles, at fifteen cents per pound. The steel drills with which the rock is blasted, are weighed out to them at so much per pound, and when returned they are again weighed, and the miner is credited with them, but the sharpening of the drills, which is a constant and considerable expense, is done by the company. The contract being finished, the contractor reports himself to the mining captain, who measures the work, accepts the job, and reports it to the clerk of the mines, who enters upon the books of the company, credits to each of the men employed upon it proportionately, for which at the end of the month they are paid.

The working hours at the mines differ; a day's work in Point Keweena mines being 8 hours, while in the Ketonagon a day's work is ten hours. I sought for some reason for this difference, but found none except that the difference has existed from the first organization of the mines, and had grown out of the fact that the Point Keweena mines being in general deeper than those of the Ontonagon, the necessary ascent and descent occupies more time.

The undergound operations of the mines are under the implicit control of a mining Captain, who is responsible to no one except the direction of the company.

The chief officer above ground is the agent and superintendent, who makes contracts and purchases, and conducts the general above-ground operations of the enterprise. A master mechanic and machinist is also employed, who superintends the section of buildings and machinery, and keeps the working machinery in order.

The clerk of the mine has charge of the books, accounts and moneys, settles with the men, with each of whom he keeps a separate account, and furnishes statedly a financial account of the condition of the mine to the stockholders. Very little money is kept at the mines, as there is no security for it in case of outbreak or violence, but the men when settled with are paid by drafts at sight upon the company at Pittsburg, Boston or New-York, as the case may be. The large mines, such as the Cliff, Minnesota, &c., have places of public worship, erected by the companies, and maintain preaching, mostly of either the Methodist or the Catholic persuasion, the Cornish men being mostly Methodists, and German miners mostly Catholics.

A physician is supported by every two or three mines, within a convenient ride, by the levy of a monthly tax of half a dollar upon every single man employed in the mines, and one dollar upon every man of family, which is retained from their pay, and paid to the physician.

The several companies enforce such rules as they deem necessary for the punishment of disorder, drunkenness, violence, &c., by deducting from the pay roll, or discharge of the offender, at their own option. No ardent spirits or other intoxicating liquors are sold to the miners, nor allowed to be sold upon the premises of the companies, and all use of them is forbidden; a state of things which has been brought about by sheer necessity, as their use among large bodies of wild and ignorant men, was found to lead to constant riots, rendering the

condition of the officers and their families disagreeable, and at times precarious. The miners who have families are furnished with cheap and comfortable houses, at low rents, by the companies, together with ground for gardens; but the great majority of them live in boarding-houses, kept by agents of the companies, at the rate of $9 per month. Each working mine has a store, at which the men are supplied at reasonable prices by the companies, with such articles as they need.

PROGRESS OF OPERATIONS AT THE LAKE SUPERIOR MINES.

The latest reports from the copper regions of the North West represent a high state of activity as prevailing there, surpassing any thing known in that region in modern days. A careful and thorough exploration has been undertaken, and some of the companies, particularly the Cliff, are about to begin a work of no ordinary magnitude. Mr. J. V. Brown, the editor of the journal published at the Saut, has gathered very extensive information respecting present operations.

At no previous season have there been exhibited, in the copper region, any thing like the activity and enterprise which characterize the present period. We are glad to learn that many of the companies have entered upon a thorough exploration of their properties, and are in some instances rewarded by discoveries of the first importance. The Phœnix Mining Company (near Eagle River) have, we are informed, recently discovered a new vein on their location, which is large and promising. The North West Mining Company have been equally lucky in finding a vein of the same character, about three-quarters of a mile east of their present works. They have a considerable force still in the field, and if their large estate does not display other veins of like character we shall be disappointed. Owning more mineral land than any other company on the lake, and situated in the very heart of the copper producing region, it requires nothing but development to make it all which its proprietors could desire.

The idea that thorough explorations should precede mining is being generally recognized. This, if acted on from the beginning, would have saved hundreds of thousands of dollars, and would have rendered many enterprises successful which have hitherto proved abortive.

But by far the most important of our intelligence is from Portage Lake. The copper interests there are making rapid progress, and are attracting much attention. About one year ago, the Isle Royale Mining Company (transferred from the island) commenced mining on a quarter section about three-quarters of a mile south of the lake, and have been unusually successful. There are on the location three veins of great magnitude, appropriately called the East, the Middle, and the West Sheldon veins, as they were discovered by R. Sheldon, Esq. These veins run with the formation, and dip to the northwest about one foot in a fathom. No. 1 shaft at the southwest is down about 45 feet. No. 2 to the 10 fathom level, and about 50 feet towards the 20. No. 3 is down to the 10; and No. 4 has just been commenced. Nos. 2 and 3 have been connected at 10, and drifting has been done south of No. 2, and north of No. 3, so as to make in all 350 feet of drifting. The vein at the 10 fathom in No. 2 shaft, is not less than 12 feet wide, and in No. 3, at the same level, 14 feet. The surface show at No. 3 would seem to indicate that it is considerably wider at that point. The company have had little dead work to do, or, in other words, they have sunk and driven wholly on the vein, and have taken out a large amount of copper in barrel and stamp work. It is believed they will this year ship, in the form of barrel work, from 20 to 30 tons of copper.

The success of the Isle Royale Company has given a great impetus to mining enterprise on Portage Lake. The Portage Lake Company are mining on the quarter section immediately north of the Isle Royale, and have taken hold

of both the Middle and East Sheldon veins, and are encouraged by developments similar to those of the Isle Royale. The lands of other companies, situated to the northeast, on both sides of the Lake, and on the course of the Isle Royale veins, are being explored—the veins have been found, and mining will commence there at an early day. In short, we now look at Portage Lake as being one of the most interesting and important points of the mineral range.

We learn that the directors of the Cliff Mine have decided to sink a shaft from the surface of the mountain north of their works, through the greenstone, in their vein. This will be a stupendous undertaking, but with such vein as they possess, the company can well afford to do great things. In fact, their mining ground, south of the bluff on the vein, is but about 1200 feet in length at the surface. As the works are increased in depth, this space increases to the north, under the overlying masses of greenstone trap, which dips in that direction at an angle of about 25° with the horizon. It is to penetrate to the productive portions of the beds, as it extends northward under this slope, that the new shaft is ordered.

If we drop a perpendicular from the southerly edge of the greenstone to the 80 fathom level, or 480 feet, and from this run that level northward, it will intersect the under face of the greenstone at about 1050 feet,—each new level of 10 fathoms depth, giving a new length to the mine of about 125 feet.

This part of the mine, of course, needs ventilation, and the distance of the main shaft is constantly increasing. On the north of the greenstone,—an unproductive band, which is half a mile in width, or thereabouts,—there is a belt of amygdaloid, which has not been proven, on the premises of the Cliff Mine; but in which, further east, as at the Copper Falls, Native Copper, and British and North American locations, there are productive veins.

By a level drawn northward into this belt, and by shafts, such as are contemplated, a new piece of mining ground may be opened on the northerly slope of the mineral range. If it proves good, we may expect to see works near the lake on that side, and eventually the product of the vein south of the bluff may be carried through the adit level, and discharged near the shore.

The surface of the mountain range is about 300 feet above the present works; in places 400 feet; and as the lowest levels are near 500 feet, the new shaft must be from 400 to 600 feet in depth to reach the bottom of the mine as it is now. This company, being circumscribed in space on the south of the bluff, must of necessity procure this metal, by descending into the earth at a constantly increasing expense.

THE ENGLISH AND AUSTRALIAN COPPER COMPANY.

At the recent Annual Meeting of this company in London, the Report was presented and adopted. Although the operations of the company are confined chiefly to smelting, their report contained some interesting facts, which are worthy of notice, as connected with copper mining operations. The following is an abstract:

The present is the second ordinary general meeting of the company. The disorganization produced by the abstraction of labor from its legitimate occupations throughout Australia, by the attraction of gold-diggings, has most seriously embarrassed the operations of this company. This disorganization has been partially, but only partially, removed. The smelters have returned to their duties in the smelting works, but all other descriptions of labor are extremely deficient; the consequence of which has been, that, although there has been an ample supply of labor to work the furnaces, there has been an absolute want of it to keep the furnaces supplied with fuel. The quantity of copper smelted at Kooringa for the year ending on the 31st of March last, has been 1,823 tons, being an average of 35 tons per week. The

quantity of ore consumed during the same period, has been 6568 tons, being an average of 126 tons per week, and the quantity of coal consumed has been 7119 tons. The quantity of ore shipped to England since the last report has been 7280 tons, of which 3080 tons have not yet arrived. It will be seen, therefore, that, notwithstanding the hindrance which has been adverted to, the company has transacted a considerable amount of business in Australia. That this has been attended with a satisfactory amount of profit, the directors have no reason whatever to doubt. But as a stock is taken at the company's works in Australia only once a-year—namely, on the 30th of June—it is impossible for the directors to state the profit of the past year until they shall be in possession of the Australian accounts to that date. The balance standing at the credit of the profit and loss account is £27,090 12*s*. 9*d*. This account, it will be observed, contains no credit for the profit which may have been made in Australia since the 30th of June, 1852, nor in Wales since the 31st of December last. At the Spitty Works, stock being taken only once a-year—namely, on the 31st of December—the profit can only be ascertained at that period. The balance standing at the credit of profit and loss would have enabled the directors to declare a dividend at the present meeting, if the funds were in this country; but, owing to the state of circumstances in Australia already adverted to, that is not the case. The want of labor has prevented coal being transported to the works, the consequence of which has been that it has required nearly the whole of the copper which has been produced to deliver to the Burra Burra Company the proportion of copper due to that company under the contract. The proprietors are aware that, by the contract between this company and the Burra Burra Company, a certain proportion of the copper produced from the ore is deliverable to the Mining Company, and the remainder retained by this company for its remuneration. If there had been a supply of fuel adequate to smelting the whole of the ore, the company would have been in receipt of its proportion of copper in a shape to be realized, instead of holding a large quantity of ore not realized. The stock of ore remaining on hand in Australia on the 2d of April last, was 5988 tons, amounting in value to about £100,000. The quantity of coals on hand, at the same date, was 5770 tons at Ports Wakefield and Adelaide, and 75 tons at the works, making together 5845 tons. The low point to which the stock of coal at the smelting works had been reduced was entirely owing to the want of means of transport. Advices from the colony of Victoria, which has been the chief point of attraction, already express a strong conviction that the supply of labor will soon be found to exceed the means of employment, so far as gold-digging is concerned. It is also notorious that, although many cases of individual success occur at the diggings, there are very numerous cases of disappointment. The smelters in the employ of this company found that they gained less money at the diggings than the amount of their wages at the smelting works. It is, therefore, to be hoped that the time is not very far distant when this great source of derangment may be removed, the Burra Burra Mine enabled to resume the extraction of ore, and this company to prosecute its smelting labors without interruption.

FIRE PROOF BRONZE COLOR FOR COPPER AND BRASS.

One-sixteenth of an ounce of crystalline verdigris, and the same quantity of finely pounded muriate of ammonia, are to be dissolved in $\frac{5}{8}$ths of a pint of rain-water, the solution left standing covered for 3 to 4 hours, and then $1\frac{1}{4}$ pint more water poured into it. The copper vessel, which must be perfectly clean, is now to be held over a charcoal fire, until it is equally heated throughout, and becomes uniformly tarnished. The copper is now to be rubbed over with the mixture, and then carefully dried.

After five or six repetitions of this treatment, the copper receives a brass color; after from six to ten repetitions, it acquires a fine yellow. If the copper is now to be changed from yellow to brown, it must no more be wetted

whilst hot; if, however, it be desired to have it a very pale brown, the process must be repeated twenty or twenty-five times. When the desired color is attained, the copper is to be laid in clean water, taking care however to clean it or dry it rapidly after taking it out. This must be done carefully. The copper is then held over a weak charcoal fire, when the bronze becomes permanent and fire-proof.

To give a fire-proof, brown, bronze color to brass, the following is the process: Three thirty-seconds of an ounce of crystallized verdigris, and the same quantity of sal-ammoniac are mixed with ⅘ths of a pint of rain-water, and left to stand for 2 to 3 hours. The brass is then to be rubbed over with it for 2 to 3 minutes, when it becomes green. 1¼ pint of rain-water is now to be added to the solution. The metal is now held over a charcoal fire, which must not be too strong, until it acquires a copper color. It is then again wetted, and left to dry by evaporation. When it has been treated in this manner four or five times, it becomes olive-colored. The heat may now be somewhat increased, but it is necessary to be very careful that the metal does not become too hot. When it has been treated nine or ten times in this manner, it becomes brown. As long as any greenish places are to be seen, however, this treatment must be continued, in many cases 20 to 25 times before the required color is obtained.

If, however, the metal be strong, the materials are to be dissolved in hot rain-water, and the metal rubbed with it immediately until it acquires a fine dark green color; it is then to be held over a strong charcoal fire, by which means it acquires a fine brown color after 10 or 12 repetitions of the treatment. It is necessary to be careful that the metal is equally heated throughout. If spots appear, they must be bitten out during the work, and polished with brick-dust.—*Gewerbeblatt aus Würtemb.*, 1852, No. 1, p. 409.—*Translated for the Polytechnic Journal.*

DETROIT AND WATERBURY COPPER SMELTING WORKS.

These works have been erected by the Detroit and Waterbury Copper Company, for the purpose of smelting the copper now brought down in such large and constantly increasing quantities from the mining regions of Lake Superior. We there discovered, scattered about the wharf of the Company, about 150 tons of mass copper, in lumps varying in weight from 20 pounds to 3 tons, much of it in as pure a state as it would be after undergoing the process of smelting or melting, and being cast into ingots weighing five or six pounds. There was also a large quantity of "barrel copper," consisting of small masses or lumps, brought down in barrels, and other quantities of fine-grained copper mixed with common sand in the proportion of about 1 to 7, or 15 per cent. of copper. As we arrived at the works, they had just completed the process of smelting about ten tons, in two furnaces then in operation. The copper, after it is melted in the furnace, is taken out in a ladle, and poured into moulds, holding, as we have said, from five to six pounds. Those ingots are placed in common barrels, preparatory to being shipped to the East.

The works of the company consist of a main building about 75 feet square, with two stack furnaces, and a wing with offices or store rooms, a blacksmith shop, a thirty horse power engine, manufactured by De Graff and Kendrick, and two blast furnaces which are "operated" or "blowed" by this engine. These blast furnaces are designed to extract the copper left by the process in the stack furnaces, which is about 5 per cent., as a much greater heat can be obtained in a blast, than in a stack furnace. We were informed that if tested to the full extent of their capacity, they were capable of smelting one hundred tons of copper a day, though the average was only about 12 tons a day, or 84 tons a week.

BABBITT'S METAL.

This composition is now used on most of the rubbing surfaces about locomotives, excepting valve faces, eccentric straps and link motions, and except-

ing, in some cases, the piston rings, cross heads and driving boxes. Its composition, as made at the oldest and largest brass foundries in Boston, is as follows:—

Melt 1 part (by weight) of copper, and then add 2 parts of antimony—stir well, and then throw in 4 parts of tin. This forms a metal called *hardening*, and is prepared for use by melting one pound of hardening with two pounds of tin. The articles to be lined are dipped in tinning salts. Boxes are placed upon an arbor, and have the metal poured in a hole on the back of the box. Gibs and similar pieces are lined on a flat surface.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

The product of silver at different periods of the present century, had been estimated as follows:

In the year	1800. Silver.	1848.	1851.
From America	$32,891,521	$29,120,000	$30,000
From Europe . . .	4,000,000	7,280,000	7,500
From Asia	....	4,100,000	4,500
From Africa, &c.	400,000	....	....
Total	$37,291,521	$40,500,000	$42,000

SILVER COINED IN THE UNITED STATES IN THE 50 YEARS ENDING 1850.

In the 1st period of 40 years, ending	1840	£11,203,215	£280,080
" 2d " 7 "	1847	3,418,941	487,705
" 3d " 3 "	1850	1,254,394	418,181
		£15,871,550	

SILVER COINED IN THE UNITED KINGDOM IN THE 50 YEARS ENDING 1850.

In the 1st period of 40 years, ending	1840	£11,203,215	£280,052
" 2d " 7 "	1847	3,418,941	364,518
" 3d " 3 "	1850	1,254,394	94,710
		£15,871,550	

SILVER COINED IN FRANCE IN THE 50 YEARS ENDING 1850.

In the 1st period of 40 years, ending	1840	£125,000,000	£3,187,500
" 2d " 7 "	1847	8,600,000	1,228,571
" 3d " 3 "	1850	15,622,895	5,207,631
		£149,722,895	

SILVER COINAGE FOR JUNE, 1853.

	New Orleans.	Philadelphia.
Half dollars	646,000	$328,004
Quarter dollars	852,000	218,000
Dimes	740,000	74,000
Half dimes	800,000	40,000
Total silver coinage . . .	3,038,000	$650,004

NEW SILVER COINAGE OF THE UNITED STATES.

The weights of the silver pieces, old and new, are as follows:—

	Act of Jan. 1847.	Act of Feb. 1853.
Dollar	412½ grains.	No change.
Half dollar . . .	206¼ do.	192 grains.
Quarter dollar . .	108⅛ do.	96 do.
Dime	41¼ do.	88.40 do.
Half dime . . .	20⅝ do.	19.20 do.
	Act of 1850.	
Three-cent piece . .	12 grains.	11.52 do.

All the silver coins are now to be made of one purity, nine parts of silver, and one part alloy. The issue of three-cent pieces now in circulation contains 75 parts silver and 25 parts alloy.

SILVER COINAGE IN MEXICO.

In a paper read before the American Geographical and Statistical Society, at one of the later meetings, by Col. Ramsay, the following facts are stated:—

In regard to the abundance of precious metals, it appears that the amount coined in 1851 was $23,166,604, of which $2,004,000 was in silver and the remainder in gold. There are seven or eight mints in Mexico. In the one in the City of Mexico, from the 23d of April, 1847, to 1852, there was coined $7,790,000, of which $7,780,634 was silver and the rest gold. At this day there are 12 silver mineral regions in Mexico. From the year 1690 to 1803 the amount extracted from the mints of this Republic, was $1,354,000,000. From the year 1784 to 1805 the moneys count $476,810,000. For the last few years the silver coinage has risen from $24,000,000 to 32,000,000, which will be seen by the official reports. The impression prevails that the quantity of silver is diminishing, but this is an error. The yield is now annually about $40,000,000, and increasing at the rate of 20 per cent. a year. Present appearances indicate that so far from silver getting scarce there will be an increase of several millions annually, as the mines now produce more than ever since the discovery of America.

LAKE SUPERIOR SILVER MINING COMPANY.

This vein is located at Michipicoten Island, Lake Superior. The vein in which the work is now done is said to exceed one foot in width. There are many veins bearing a northwest and southeast course, which at the surface and at the lake shore appear to run parallel with the silver vein; and in one of them, which bears the red oxide of copper, about ten inches to one foot wide, we have found some silver. At the distance of about eighty or one hundred yards to the east of the silver vein there are several copper bearing veins running northeast and southwest and straggling in various directions, which no doubt all connect inland.

FROM LAKE SUPERIOR SILVER MINE—ANALYSIS OF ORE.

New-York, August 18, 1851.

I have analyzed a sample of washed ore for Mr. J. Bonner, of Quebec, which sample weighed half a pound avoirdupois (3,500 grains), and was taken from a parcel weighing two pounds and three ounces, stated to be from the Island of Michipicoten, Lake Superior. From the half pound of ore I have separated 6-8 per cent.

JAMES R. CHILTON, M. D., Chemist.

New-York, August 15, 1851.

Silver assays from mine on Michipicoten Island for Mr. Bonner:

No. 1. Per 1,000 lbs. ore 1,100 ounces of silver, 6 14-16 per cent. at $1 30 per ounce - - - - - - - - - - - - $1,430 00

No. 2. Per 1,000 lbs. 750 ounces silver, 4 11-16 per cent, at $1 30 per ounce - - - - - - - - - - - - - - 975 00

No. 3. Refuse per 1,000 lbs., 50 ounces silver, 5-16 per cent, at $1 30 per ounce - - - - - - - - - - - - 65 00

JOHN WARWICK, 17 John-st.

I have analyzed a sample of ground ore received from Mr. Geo. K. Smith, and find it to yield, from one-fourth of a pound avoirdupois, 2,482 grains of fine silver, which is equivalent to 403 ounces 6 dwts. to the ton, or 2000 lbs. The ore yielded also ten per cent. of copper.

JAMES R. CHILTON, M. D., Chemist.

NEW-YORK, October 15, 1852.

I have analyzed the amalgam left with me by Mr. A. Jay Smith, and find it to yield 17 dwts. of pure silver.

JAMES R. CHILTON, M. D., Chemist.

NEW-YORK, May 9, 1853.

THE SILVER MINES OF POTOSI IN SOUTH AMERICA.

The far-famed veins of Potosi have never been exhausted of their treasures. The condition in which the Spanish miners left the works, and the present state and aspect of the mines, are very graphically described by a resident of the country, who is a regular correspondent of the New-York Courier & Enquirer. He writes with much intelligence on the subject :—

The mines of Potosi have so long been celebrated, that nothing need be said of them in respect to their productiveness in former times. It is undoubtedly true, that immense quantities of valuable ore were thrown away as refuse, for the old diggings are now worked a second or third time at a profit. It will be correctly inferred, that the mining business is of little value now, compared with what it was in times of Spanish ascendency; and in the later years of that period the profitableness had greatly diminished. It has been constantly diminishing from that time to the present, or till within two years.

The cause of this change was first, the increase in the price of quicksilver, with which all the silver is extracted. The cost of fuel is too great to allow of smelting, and the cost of roasting the rich sulphurets of silver to fit them for the process of amalgamating, is such that they are often thrown away. The price of quicksilver is therefore an important element in the profits of the silver mines. A very few and unimportant mines of quicksilver have been opened in South America, but the recent reduction of price has resulted chiefly from the production of that metal in such abundance in California. The silver works, and particularly those of Potosi, have consequently improved very much in the last two years.

A second cause of the reduced production of the mines was the withdrawal of foreign capital during the unsettled state of the country, while the several States were struggling for independence, and for a long time after that period. At one time the English were ready to throw in a large amount of capital, and to considerable extent carried their favorable intentions into effect; but the country was unprepared to profit by them, and total loss was the only result.

The only other cause of importance, and the one which had been seriously felt, while the countries of South America were Spanish Colonies, was the ingress of water into the mines to such an extent that many of the best of them they had already abandoned. The most productive vein of silver which has ever been known, not excepting the richest of Mexico nor those of Copiapo, now yielding so astonishingly, is undoubtedly the great vein of Potosi. It appeared at the surface but a little way down from the apex of the mountain, and continued to be seen at the surface and seven yards wide for a thousand feet down the slope. It was this vein which gave the mountain its celebrity, and from which for a long time the great mass of the treasures of Potosi came. Its breadth and directness was such, and the quantity of ore so great, that for forty years it was worked without occasion for artificial light.

There are four other large veins, all cutting the mountain nearly north and south, and parallel to the principal vein. Though these five veins do not show themselves completely to the base of the mountain, yet the fact that nearly all

of the profitable workings on the lower slopes of the mountain have been nearly in the planes of these large veins, show that these veins continue downward, though they do not come to the surface.

It is these offshoots, ramifications from the large veins, which have of late years been worked. It is even the opinion of the most intelligent men of the city, that if worked on a large scale and with every attention to economy, every part of the mountain contains a sufficient per cent. of silver to justify the undertaking and insure a reasonable profit. They say that every ton of rock or earth taken indiscriminately from the mountain, at the surface or deep below the surface, will probably produce eight dollars of silver, which is more than the necessary expense of working a ton of the ore.

However this may be, it would never have satisfied the early Spanish proprietors. They for a long time confined themselves to the broad and rich veins, and followed them to great depths. At a certain level the water came in upon them in all the veins, that, with the means then in use, it was impossible to keep the mines in a workable state. Operations were, however, continued in them, the men standing deep in the water till the government interfered, as a sanitory measure, to prevent it.

In order to recover veins of such immense productiveness, the King of Spain authorized the cutting of a channel, or tube, nearly horizontal but slightly ascending, from the base of the mountain to its centre. It was an immense undertaking, especially for those times, and though suspended without reaching the vein, it was carried to the distance of about four thousand feet. The tube is well arched, wherever such work is necessary. The entrance is a fine piece of masony, surmounted by an appropriate inscription and the arms of the King of Spain.

For a long time the work was abandoned. A company at length recommenced work, but soon abandoned it a second time, and their right was forfeited. They, however, obtained from Government a renewal of right, and one man alone has continued to make such annual appropriations to the work as merely to prevent its again reverting to the Government. Upon a careful examination of this tube, or as they call it, *socavon*, I am convinced, in opposition to the prevailing impression here, that it is favorably situated for the attainment of the object contemplated. There must be a very considerable outlay before any profits are to be realized, and upon a different plan from any that has yet been adopted; but there is one which will be free from all the uncertainty that has hitherto attended the work, and from all the contingencies of ordinary mining. If the statements made to me are reliable, and they may be easily verified, a company, by a certain amount of expenditure, that is, by cutting a certain number of yards, will be sure to strike that largest and richest vein. It seems a great pity, that a work so nearly accomplished should fail of the last blows and the rich recompense. It is reserved for some future adventurers, who however venture nothing, and I wish that some of my countrymen may fall in with so tempting an opportunity. It is the only good thing that South America offers. This is good: first, because it is a certainty: secondly, because the vein when reached is one of unquestionable and immense value. But I did not come to this country for any such purpose, and here leave it for those who have the energy, the capital, and the disposition, to come into the possession of this vast fortune.

I have said that, at a certain period, the excavation of this socavon was abandoned. I ought to add, to prevent misapprehension, that the engineers of the Spanish Government abandoned it only when the Government abandoned every thing. It was worked till the battle of Ayacucho. The resulting Government has never been in a condition to resume that or any other of the works which Spain improved to such immense advantage to herself.

In my peregrinations, over and around, and through the mountain, I have occupied many an hour in endeavoring to discover its theoretical structure. It has long been to me a mystery, and is so still, though I have hope that light is

beginning to break in upon me. It is represented in works on Mineralogy as chiefly of an argillaceous composition, but this is inaccurate. There are a few places where argillaceous rock is found, but the great mass of the mountain, externally and internally, is a silicious rock of igneous origin, and often, even generally, so porous as to resemble the scoriæ from a furnance. It has also been represented as an extinct volcano. If it was even part of a crater of eruption, which I can neither affirm nor deny with confidence as yet, it has been subjected to remarkable changes, and the changes have been so regular as to leave now but a single pinnacle, and that of extremely regular form. Near the base, on the north side, there has been a lava stream of considerable dimensions thrown out, which has extended so far, that part of the city is built upon it.

A CORRECTION.

In the remarks introducing the report of Dr. Percival, on the Middletown Lead Mine, in the August number of the *Mining Magazine*, the name of Dr. *Jackson* was accidentally substituted for Dr. *Percival*, as making the report on the mine. Dr. Jackson has made no report on the Middletown mine, and we make this correction in answer to inquiries after the report, and also, that even a typographical error may not lead to an erroneous impression.

In 1835 the amount of lead produced in the United Kingdom was estimated at 46,112 tons; of which 19,626 tons were furnished by Northumberland, Durham, and Cumberland. In 1847 the total produce was as follows:—

	Lead Ore. Tons.	Lead. Tons.
England	59,614¼	89,507¼
Wales	18,147¼	12,294
Ireland	2,251	1,380
Scotland	1,159	822¼
Isle of Man	2,575	1,699
Total	83,747	55,703

EXHIBITION OF LEAD AT THE CRYSTAL PALACE, LONDON.

Specimens of lead ores and associated minerals, were exhibited, with examples of the various stages of progress, from their being excavated in the mine and carried through the several departments of washing and smelting, until furnished and ready for the market, in the form of a cake of silver and a pig or piece of lead, known as W. B. lead.

The specimens of minerals usually associated with lead ores were collected from various mines, and are fitted together in a separate case, under the direction of the exhibitor.

The general arrangement of the strata in which these ores and minerals are found, was exhibited by a section of part of the lead mining district belonging to Wentworth Blackett Beaumont, Esq., at Allenheads, in the county of Northumberland, and from whose mines the specimens of lead ores and examples of process during conversion into lead and silver were taken: and a further illustration of the geological structure of this part of England was given by an isometrical plan and section by the exhibitor, showing a considerable tract of mining ground in the manor of Alston Moor, in the county of Cumberland.

The principal phenomena of mineral veins and displacement of the strata in which lead ore is obtained in the north of England were shown by dissected models, invented by the exhibitor, and examples of the finished products are contained in a separate case from Mr. Beaumont's smelt-mills, under the direction of his agent, Mr. Thomas Steel.

This collection, the general nature of which is here briefly indicated, was intended to illustrate the geological position and usual products of the north of England lead mines.

The following is the order of the five several portions, and which are more particularly described under these several heads in the sequel.

1. Sections of strata at Allenheads and Alston.
2. Models to illustrate mineral veins, &c.
3. Minerals associated with lead ores.
4. Examples of the various stages of progress from the mine to the market.
5. Lead and silver prepared for sale.

1. As the express object of this collection was to afford a general view of the whole of the principal features relative to the extensive and important departments of British industry connected with lead mining, and as this information was more expressly intended for the use of those who are not locally conversant with the physical conditions under which lead ores are usually obtained, the exhibitor in the first instance thought it necessary to present clear and distinct views of the geological structure of the districts in which the chief lead mines of the north of England are situated, in order that, without going into purely technical details, which are only of local interest, the several strata and order of superposition may be readily understood.

As an approximate comparative view of the produce, it may be considered that the lead raised in Mr. Beaumont's mines amounts to about one-fourth of the quantity raised in England, about one-sixth of the produce of Great Britain, and about one-tenth of that of the whole of Europe, including the British Isles. They have been extensively worked from time immemorial; part of them are situated in the manors belonging to Mr. Beaumont in the dales of East and West Allen, in the southwest part of Northumberland, and others are situated in the wild district of moors which forms the western extremity of the county of Durham.

This part of the country happens to be at once the centre of the island of Great Britain, and by far the most elevated part of it which is thickly populated; for, scattered over hills and dales, which present an aspect of verdant cultivation mixed with heathy moors, are to be found some thousands of inhabitants, nearly the whole of them either employed in lead mines or smelting-mills, or indirectly deriving a livelihood from some connection with lead-mining business. Allenheads forms a central position in the midst of these mines; and the agent's house, shown on the section, is exactly 1,400 feet above the level of the sea, and is the highest house of its magnitude in Great Britain; nor are many of the cottages of shepherds and other moorland habitations of greater elevation.

The datum or base line of the Allenheads section is 700 feet above the level of the sea. The drawing, 16¼ feet in length, is on a true scale of 100 feet to an inch; by a true scale being meant, that the lengths and heights are projected to the scale or proportion, so that a true miniature profile of the country is given, as well as a correct reduction of the relative size of the various rocks. The extent of country thus shown is not quite 4 miles, being 3 miles 1,220 yards.

The spectator is supposed to be looking to the north, and the section commences at a point about half a mile eastward from a place called Kilhope Head, which is conspicuously marked in all English maps, inasmuch as the three counties of Northumberland, Durham, and Cumberland all meet in one spot. At about three quarters of a mile from the point of commencement, the section represents the hill called Kilhope Law; it is on the boundary line of the counties of Northumberland and Durham, and is the highest point of land in the last-named county, being 2,206 feet above the level of the sea. But out of the limits of this section, and about 10 miles southwest from Kilhope Law, the same strata which were delineated reach an altitude of 2,901 feet above the sea, and this is the highest elevation attained by the rocks which form the carboniferous or mountain limestone of the north of England.

Such being the stratification of the central portion of the narrow part of the island, of which the coal fields of the Tyne and Wear from the extremity

on the east bordering of the German Ocean, for some distance north and south of Newcastle, while a similar coal field is found at the western extremity near Whitehaven, it may be observed with reference to these coal fields, that they lie over or upon the mountain limestone formation. The coal beds so extensively worked in the Newcastle and Durham coal mines or collieries, gradually rise to the west, and one by one crop out or bassett according to the undulations of the country. At length, at about 20 miles west of the German Sea, the lowest of the coal beds crops out, and from beneath it gradually appear the limestone strata, which continue to rise nearly coincident with the general rise of the country until they reach the summit of Cross Fell (2,901 feet). And this general and very gradual inclination of the strata, a feature of the greatest importance in practical mining, was clearly and accurately delineated in this section.

In a thickness of about 2000 feet of the alternating beds of sandstone, clay, and limestone, which form the strata of the mining districts of Alladale, Alston, and Weardale, there is one single stratum of limestone, called the "great limestone," the veins in which have produced nearly, if not quite, as much ore as all the other strata put together. This stratum was delineated on the section, lying at a depth of about 850 feet below the summit of Kilhope Law. Somewhat exceeding 2 miles eastward of this, at Allenheads, the top of the great limestone is 230 feet from the top of a shaft called Gin-Hill Shaft. Its thickness, which is tolerably uniform over several hundred square miles of country, is about 60 feet; and it was from this stratum of limestone that nearly all the specimens in this collection have been obtained.

The dislocations of strata which constitute for the most part important mineral veins, were exhibited more in detail in the series of geological models which formed a part of this collection; but some of the great features of displacement may be noticed.

At about a quarter of a mile to the west of, or left-hand direction from Kilhope Law, the great limestone, and all other associated beds, are thrown down a depth of about 150 feet for a space of nearly 700 feet; and again, at the distance of nearly a mile from Allenheads, a vast dislocation takes place, by which the great limestone, it will be seen, is brought nearly to the surface, the amount of displacement being about 400 feet. It is in the great limestone that by far the most extensive portion of the workings of Allenheads lead mines are situated, and the galleries drawn on the section convey a general idea of the position of the mines. In a great thickness of strata about the great limestone, only two beds of that rock are found. One of these is called "little limestone." It is from 10 to 12 feet thick, and is 75 feet above the top of the great limestone. The other is still more inconsiderable, being only 3 or 4 feet thick, and is 440 feet above the great limestone. It is remarkable with what exactness this thin bed is found near the summit of hills, the intervening spaces having apparently been removed by denudation, so as to form in one case a gap of 6¼ miles, and in another of 1½ miles, in which the Tell Top limestone is entirely cut off.

But beneath the great limestone, are several beds of the same description of rock, viz., at distances respectively of 30, 106, 190, 250, and 287 feet, and the thickness 2, 24, 10, 15, and 35 feet. These are known by descriptive local names, and comprise all that are of significance as regards lead mining operations.

The Allenheads mines being situated for the most part at depths from the surface varying from 200 to 600 feet, are drained, partly by ordinary waterwheels, some of which are shown on the section, and partly by the new hydraulic engines invented by Mr. W. G. Armstrong, and four of which are now in use for draining and other mining purposes at Allenheads mines.

Examples of the various Stages of Progress from the Mine to the Market.—This part of the collection was arranged in five cases, each containing six boxes of one square foot each, being in all thirty boxes.

Fifteen of these boxes, contained specimens of lead mining from the excavation of the ore in the mine, and showing the several stages of progress until ready to send to the smelt mill; and the other fifteen boxes contained specimens of the ore as prepared for smelting, and its various stages of progress until manufactured into lead and the silver separated; these finished products being contained in division No. 5. of the collection.

Case No. 1.—Lead ore, as first separated from the vein in which it is found, and which in this state is called "bouse" in the north of England lead mines, and the places in which it is deposited at the surface are called bouse teams. The depositing of the ore in these places is greatly facilitated at Allenheads by the use of tipping-frames of a new construction, by Mr. W. G. Armstrong, of the Elswick Engine Works, near Newcastle-on-Tyne. This example is from a "flat" vein in Allenheads mines in the great limestone, which rock forms the curiously laminated matrix with which the ore is intermixed. The ore and rock thus intermixed require to be separated as is exhibited by the following examples. By a flat vein, or "flatts," is meant a horizontal extension of mineral substances to a considerable distance from the ordinary vertical or steeply-inclined veins, which extend in the manner of fissures through the various beds of rock forming the district. The regular lamination of the ore is worthy of attention, as leading to speculations on the origin of mineral veins; a subject of great practical importance. The example here shown is taken from a part of the "flatt workings" at a distance of about 20 feet from the principal or nearly vertical part of the vein.

Case No. 2.—Bouse, or lead ore, as extracted from the vein, and showing an example of the curiously polished surface, which is a frequent characteristic of veins, and which would appear at first sight to have been very carefully polished by artificial means, many of the surfaces being sufficiently clear to reflect the images of objects in a tolerably definite form. The local name of such bright and polished surfaces is "*slickensides;*" and the suggestion mentioned in the notice of the last specimen as to the value of scientific inquiry, applies with still greater force to the class of phenomena of which this is one of the most curious indications.

Case No. 3.—Contains a portion of the ordinary bouse or ore as newly worked from the vein, and much intermixed with the materials contained in Cases 1 and 2, as well as with other earthy and sparry contents of veins. The produce of mineral veins varies from pure galena, of which some species are shown, to masses of rock in spar, in which the ore is so thinly disseminated as not to repay the trouble of extraction.

Case No. 4.—The intermixed rocks and ores shown in preceding cases are first subjected to "picking," and then to "washing" on a grate. The first of these operations separates from the general mass all such pieces of galena as are either not mixed with other substances, or which can be readily separated with a hammer on what are called "knocking stones;" and the second has the effect of clearing away all earthy matter. These specimens, picked from the heap and washing-grate, are ready for smelting after being reduced with a hammer to the size of the ore contained in Case No. 9.

Case No. 5.—Contains ordinary bouse or lead ore taken from the *trunking-box* after passing through the *washing-grate*, being, in fact, a process of *washing and sizing* with a view to the further operations exhibited in the following cases.

Case No. 6.—Contains specimens of ordinary bouse, which, from the size of the pieces and intermixture of rock and ore, require to be passed through the rollers of the crushing-mill.

Case No. 7.—Specimens of the same bouse or ore after having passed though the rollers of the crushing-mill.

Case No. 8.—So far the processes have consisted simply of extraction of the ore from its place in the mine,—of the pure samples of ore being picked out and washed and sized, ready for being smelted at once without further opera-

tions,—of the remainder of poorer samples being washed and separated by an iron grate or sieve into two sizes, the larger having to be ground between rollers to reduce it to the same size as the smaller, which had passed the grate; and when reduced to this stage, the whole is ready for an operation called "hotching," which consists in placing the ore in a tub with water. The bottom of this tub is a sieve,—and the whole is subjected to a rapid vibratory vertical movement or shaking, by which a separation of the ore takes place. The water so far lessens the weight as greatly to facilitate the downward movement of the ore, which of course is much heavier than the spar and other materials connected with it. The vibratory movement is sometimes given by manual labor: a long arm moving with a spring is jerked up and down by a strong lad jumping on a raised stand so as to produce the required motion. The same results may be obtained by machinery.

The remaining cases exhibited specimens in detail of each step of the process of smelting, which it is unnecessary to describe.

NORTH, EAST AND SOUTHAMPTON MINES.

To the Editor of the Mining Magazine:—

SIR:—I made a hurried visit for geological observation, in company with Mr. Charles S. Richardson, a mining captain of great reputation in England, who has just arrived in this country, to the North, South and Easthampton Lead Mines, last week.

We came first from Northampton, to the tract lying near the road running to Southampton, which has been leased by a Mr. Cleveland. Here are two shafts sunk, which were worked a short time and afterwards abandoned. A considerable quantity of ore presenting an excellent appearance, was obtained. On the same vein and adjoining, the Northampton Silver Lead Company have a lease covering a distance of nearly three miles. They have sunk a shaft forty feet deep on the part of the vein near Cleveland's track. But it is my impression the vein should be worked by a level adit, as it is very conveniently situated for it. They have obtained quite an amount of ore, and all the indications are that there is a rich and regular deposit. Baryta is also found in the vein extensively, and in such quantities as perhaps to become an article of commerce.

We next went to Southampton. Here a shaft was sunk upon the vein of the Hampshire Consolidated Company, previous to the revolutionary war. It was subsequently filled with water, which was afterwards removed and drained for the purpose of examination, and a fine show of ore presented itself. An abundance of ore lies around the shaft. It was determined to work the vein by a level adit. This work has progressed more than 1100 feet, and will shortly reach the vein, say in about twenty feet. The vein shows itself sufficiently on the surface.

At Easthampton Captain Pinch has opened a lode by a level adit of about one hundred feet in length. Here is the greatest show of all. Capt. Richardson was struck with astonishment, and exclaimed that he had never witnessed any thing of the kind surpassing the spectacle before him.

Having thus learned the inclination of their vein and its character, by the level adit, they have resolved to sink a shaft, which I think will be attended with flattering results. I have no doubt this vein in Easthampton is the same with that in Northampton. The ore and veinstone present the same appearance, and in the level adit at Easthampton there was also found a quantity of baryta. The vein appears to be cut by a *cross course*, and heaved off from its course at that spot. There would be a splendid show, I think, if the company would open the vein near the *cross course*. We shall shortly have, I am happy to state, a complete view of the geology of this section, as Mr. Richardson is about to commence a full survey of it, and prepare a geological map of the same.

AUGUST PARTZ,
Mineralogical Chemist and Mining Engineer.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1853.

Amount shipped from Richmond, Pa., to the close of the week ending August 6th	649,236	tons.
To same time last year	784,896	"
Decrease	135,160	"
Amount sent by Pottsville, Reading, and Philadelphia Railroad, to close of week ending August 18th	990,120 01	"
Amount by Schuylkill Canal since the opening of navigation, to August 18th	485,224 12	"
Total by railway and canal	1,475,344 13	"
To same period last year	1,537,646 10	"
Decrease this year	62,301 17	"
The result of the Lehigh Coal trade, to the close of the week ending August 6th, has been	572,084 06	"
Last year up to same time	602,580 10	"
Decrease this year	30,496 10	"

DELAWARE AND HUDSON COAL TRADE TO JULY 30TH.

Penn. Coal Company	221,410	"
Delaware and Hudson Company	220,030	"
	441,440	"

CUMBERLAND COAL REGION.

Amount sent from Cumberland region, for the week ending Aug. 18th	13,890	tons.
Total for the year	280,717	"

REPORT OF THE PENNSYLVANIA COAL COMPANY FOR 1852-3.

The Board, in submitting to the Stockholders a statement of the business of the past year, has but few remarks to offer.

The coal brought to market during the year 1852, amounted to 426,164 tons, exceeding by 109,000 tons, the production of the preceding year. The net profits of the year are shown, by the statement annexed, to be $330,354 08, or equal to 11 per cent. on the capital stock. Two dividends of five per cent. each have been declared; leaving a balance of $30,354 08, of which the Board has appropriated $20,000 towards extinguishing the original expense of opening mines. The residue of profits added to the surplus of previous years, leaves a reserved fund to the credit of profit and loss of $132,923 19.

Ample provision has been made during the past year for increasing and facilitating the business of the present and future years. New openings have been, and are being effected into the mines; additional cars and canal boats have been built; new machinery has been erected for screening the coal at the mines; and numerous sidelings and other improvements of a permanent character have been constructed upon the road.

Sufficient transportation arrangements have been made to bring to market, during the present year, not less than 500,000 tons of coal; and it is expected that such estimate will be realized, unless frustrated by some contingency which the company cannot control.

The increasing consumption of coal in the manufacture of iron, in addition to the gradual extension of its use, as a fuel and for steam purposes; and a failure, during the present season, of the other regions to enlarge their supplies, has created a demand for anthracite coal, which must continue to an extent

sufficient to secure, during future years, favorable sales for all that can be produced and brought to market by the existing means of transportation, and those which are in progress.

By order of the Board,
JOHN EWEN, President.

July 27, 1853.

STATEMENT OF THE BUSINESS OF THE PENNSYLVANNIA COAL COMPANY
For the Year ending May 1st, 1853.

Dr.		Cr.	
To coal on hand in Pennsylvania per last report, and cost of coal mined in 1852	$306,193 91	By sales of coal to May 1, 1853 ..	$1,405,443 87
" Road expenses.............	221,031 76	" Amount received for transportation of merchandise over company's road, profits on lumber, barges, &c......	44,370 55
" Freight and tolls on canal....	620,457 22	" Balance of interest account...	14,155 71
" Port Ewen expenses	39,385 63	" Coal on hand...............	207,667 41
" Salaries, current expenses, &c., New York office	29,666 22		
" Interest paid on mortgage bonds	30,273 65		
" Coal yard and harbor expenses, rents, taxes, depreciation of tools, improvements, &c.	94,275 07		
" Balance	330,354 08		
	$1,671,637 54		$1,671,637 54
		Balance......................	$330,354 08

GEO. A. HOYT, Treasurer.

THE PENNSYLVANIA COAL COMPANY IN ACCOUNT WITH THE TREASURER,
To May 1, 1853.

Dr.			Cr.	
To capital stock		$3,000,000 00	By real estate, docks, &c.	$955,026 14
" 7 per cent. mortgage bonds ..		600,000 00	" Canal boats...	445,575 54
" Bonds and mortgages payable		78,582 23	" Payments on contracts for new boats	50,598 62
" Bills and accounts payable ...		145,806 36	" Barges and steamer "Pittston"	25,402 27
Balance per last report $226,404 76			" Opening mines..............	162,588 75
Paid dividend July 12, 1852 $84,000			" Railroad	1,923,288 14
Credited opening mines,'52 $12,000	96,000 00		" Sundry disbursements on account of business of 1853, &c.	143,881 88
Surplus per last report	130,404 76		" Balance due from Delaware & Hudson Canal Company. .	29,608 18
Earnings for 1852, per business statement..	330,354 08		" Balances in hands of agents of the company..............	10,488 47
	$460,758 84		" Bills and accounts receivable, cash on hand, &c	183,798 32
Paid sundry expenses of 1850 and 1851 not in last report..$8,105 65			" Coal on hand, tools, materials, &c........................	216,515 52
Paid 5 per ct. d'dend, Jan. 3, 1853.....149,730 00	157,835 65			
Balance..........	302,923 19	302,923 19		
		$4,126,761 78		$4,126,761 78
			Balance....................	$302,923 19

GEO. A. HOYT, Treasurer.

AN ANTHRACITE COAL MINE.

The following particulars relate to a coal mine at which operations have just been commenced. It is situated near the village of St. Clair, Schuylkill county, Penn.

The slope is sunk on the northern portion of the property, and descends with the vein at an angle of about 18 degrees, and extends down to the distance of 200 yards. The vein is the celebrated mammoth seam, and at this place is about 25 feet in thickness; overlaid by 12 feet of slate, supporting another body of coal, 7 feet in depth, thus giving 32 feet of coal in two masses. The machinery for hoisting consists of two engines 45 horse power each, operating on the same shaft, by cranks at right angles; thus giving 90 horse power, but working to better advantage than could be done by any single engine with their combined capacity.

The hoisting engines and machinery are, we are informed, able to raise 1000 tons per day from a slope of the same depth as this of Maginnis; the capacity of this work is rated the same as that at Mauch Chunk. The cost of the entire improvement when completed will be $40,000, and it will rank second to none in Schuylkill county. The breaker belonging to the concern is also designed on a large scale. An engine of 35 horse power is employed for this part of the work, and the rollers, in addition to being of the largest class, are driven on wrought, instead of cast iron axles.

If any one is desirous of forming an estimate of the mineral wealth of this section, this tract forms a fine problem for solution. In it there are 420 acres, and beyond doubt the coal-bed underlies the entire tract, without much fault, or variation from the thickness given above. At least such has been the character of the vein as worked in that vicinity. To arrive at the number of tons, the rule adopted here is to count every cubic yard as a ton; and this probably does not vary much from the truth, and to get at the value, the coal is estimated at 25 cents per ton in the vein. The result of the calculation will be of such immense magnitude as to startle the calculator, and he will hardly believe in his own figures. But to prepare the mind, let him imagine a tract of land of similar size, covered with a solid rock of coal 32 feet in thickness, or of a depth greater than the height of an ordinary house, and he will not be so much astonished when he finds his tons running up to millions. Allowing one-half for fault, wastage and diminished thickness of vein, and yet there are millions of tons of fuel on that single tract; and when in fair operation, it will yield to the owners a revenue sufficient for the support of a small State.

MARYLAND COAL REGION.

At the Lonaconing coal works, a new feature has been introduced, by sinking the track of the cars below the floor of the chamber workings, which is regarded as an improvement. It is thus described by Mr. John Hitz, Mining Engineer, to which are added some facts respecting the vein and manner of working it:

That vein crops out at Lonaconing several hundred feet above the level of the creek, and on the west side of the valley. The slope of the mountain-side rises at some forty degrees. From this position the first main-heading adit is started, and follows a straight line in a westerly direction on a rise of one foot in one thousand, being the inclination of the coal-bed; this has been explored for several hundred feet, still leaving a prospect for miles in extent ahead. At regular intervals along the main-heading adit, the cross-heading galleries turn off at right angles, opening the coal field north and south. Along the side walls of the cross-headings the chamber entrances are formed into regular squares, and thus allotting to the several associate parties of miners their work of excavation, wherefrom the assisting miners fill the coal cars and run them to the mouth of the adit.

A particularly advantageous feature of the Lonaconing coal works I desire here to notice: the railroad track in the main and cross-heading galleries lying two feet below the floor of the chamber-workings, has thus secured to the miner perfectly dry and very convenient mining. These two feet of coal forming the

floor of the vein are purposely left untouched in the chambers not only on account of the reasons above stated, but also in regard to the character of that part of the coal vein being interstratified with two small seams of slate, and thus affecting more or less the purity of the marketable coal. The other part of the vein, twelve feet in height, presents a breast of solid, pure coal, without the slightest trace of slate. This is a rare sight to the miner, and a rare satisfaction he enjoys considering the little difficulty he is going to meet with in his laborious work. There is no costly machinery needed, no injurious gases have as yet been experienced, and with little care and small expense the underground works are made perfectly secure and safe.

Passing through the underground works an idea has been suggested to my mind, to carry out which the existing arrangements here are peculiarly adapted. Why not lay the rails of the track two feet above the ground, and on crossties, floor over the width of the adit hermetically, and thus divide the same into two separate apartments? This produces a natural draft of air, besides securing to the water in the mine a never-obstructed passage, which otherwise we find so often impeded by the debris falling from the coal-cars. Galleries to the length of four hundred yards I have seen driven without having recourse to mechanical means for procuring ventilation.

The coal having once arrived at the mouth of the main-heading adit, requires no more handling; it is pitched from the mining cars into the eight-ton coal-car, stationed a few feet on the lower level, and from thence is sent on its way, without further interruption, to market. The fine coal, however, as much as will be the unavoidable result in mining, is converted into coke and used at Lonaconing for smelting and other purposes.

ANALYSIS OF PARKER VEIN COAL.

The result of my analysis of the Parker Vein Coal, from the main 14 foot bed, at its out-crop in the east side of George's Creek Valley, gave

	No. 1, Parker Coal, 14 foot bed.	No. 2, Cleary Coal, 9 foot bed.
Moisture,	0,04	0,00
Other volatile matter,	14,89	17,24
Earthy matter (ashes),	3,30	5,24
Fixed carbon,	81,77	77,45
	100,00	100,00
Coke,	85,07	80,24
Specific gravity,	1,281	1,305

I have placed it in juxtaposition with an analysis by W. R. Johnson, of the 9 foot bed, which crops out in the eastern slope of Dan's Mountain in Preston Hill, watered by Cleary Run, which lies about 5 or 6 miles higher up the valley of George's Creek, to the northeast, both being in the same coal basin.

I have done so the better to contrast its composition with the Cleary bed of coal, because the economical value of that coal has been fully tested with other American coal now in use. The two beds are very analogous in their composition, as well as most of the other numerous beds of this coal field. It will be observed, however, that the Parker Vein Coal is of superior quality, as indicated by the analysis, containing as it does, 4.32 more fixed carbon, and nearly two per cent. less ashes; yet, as I am about to show, the Cleary coal is one of the very best American coals now in use. Compared with the Frothburg coal, which usually goes under the name of "Cumberland Coal," and which lies at the extreme northern extremity of the coal region, its superiority is still more conspicuous, as the Parker Vein Coal contains 7.25 more fixed carbon, and 5.10 less earthy matter or ashes.

Thus it appears that the 14 foot Parker bed is of better quality than any coal hitherto in use from this coal district; and the Ocean Steamers have yet

to test the qualities of the best Maryland Coals against the coals of South Wales, since the Parker bed contains from 2 to 7 per cent. more fixed carbon than the coals in market from the associate beds; and all other things being equal, it is upon this chemical ingredient that the durability and efficiency of coal mainly depends. The Parker Vein Coal, in common with most of the coal of George's Creek Valley in Maryland, takes the very highest rank in the whole list of American coals now in use, for purity, strength, economy and efficiency.

For evaporating power, under equal bulks and weight, George's Creek Coal stands at the head of the best American coals now in use, generating from 11 to 12 lbs. of steam at 212° F., for one of combustible matter.

For heating power in a blacksmith's forge, compared with other bituminous coal, they take the highest rank; both of these coals being capable of forming from 18 to 20 links of chain cable, while Scotch coal only makes 10, the Liverpool 13, and the Newcastle 14 links.

The above statements supply conclusive evidence of the great superiority of Parker Vein coal, and explain fully why the Cunard line of steamers prefer the coal from this coal field to any American coals now in market, though they have yet to be furnished from the best bed and localities in this carboniferous basin.

Besides the main 14 feet bed on the lands of the Parker Vein Company, there are at least two workable beds above it and three below it, and intercalated with these latter, there are from 9 to 10 beds of iron ore, varying from 1 to five feet in thickness.

From the aggregate thickness of all the coal beds, say 12 yards, and the weight of the coal, which averages about 53 to 54 pounds per cubic foot, in the mercantile condition, and allowing for waste, we would have about 50,000 tons of coal, or 1,624,000 bushels in each acre; and as the beds of coal probably extend over at least 1,200 acres of the lands owned by the Parker Vein Company in the George's Creek Valley alone, we have the approximate safe estimate of 60,000,000 tons of coal on this portion of the Company's property.

The mineral resources of the George's Creek Valley are, therefore, immense; indeed there never was a coal and iron region which more fully justified all necessary outlays to obtain the *most direct outlet* to the principal markets of the United States.

The value and excellent qualities of the main Parker Vein Coal will not be fully appreciated until it is fairly in market, and it comes in direct competition with other coals. D. D. OWEN, Geologist.

New Harmony, Ind., June 12, 1853.

COAL IN MICHIGAN.

It is well known that a large and extensive coal formation exists in this State, which is duly waiting to be developed by the wants of the people, who will soon need it to enable them to compete with other localities, in the manufacture of iron. The editor of the Ionia Gazette states, he has been shown within a few days, a specimen of coal taken from the banks of the Grand River, at Grand Ledge, in Eaton county, and he goes on to say:—" We have no hesitation in pronouncing it a good sample of *Anthracite*. It is impregnated to a considerable extent with sulphurous substance, and exposure to the air has divested it of that flinty texture, solidity, and compactness which are common to this species of coal. We understand it is found in veins from 12 to 18 inches in thickness on the left bank, and in the bed of the river. No scientific survey has yet been made, but from the superficial examination that has already been had, the conclusion is that a vast amount of this useful and valuable article underlays the country about the village of Grand Ledge."

COAL MINING IN PRUSSIA.

The return of coals shows a rapidly increasing production of the great fields in Silesia, on the Ruhr, and on the Saar, as well as that of Aix la Chapelle.

The number of hands employed increased more than nine per cent. in 1852, over 1851; and the quantity raised 13 7-10ths per cent. As nearly all the mines are as yet working only their upper seams, and the excavations have extended to no great distance from the shafts, they are all obtaining good profits, at the moderate price of about five shillings per English ton. which is given as the average of the kingdom. Owing to the circumstances that the best iron ores are not to be found in the coal measures, iron is only smelted with coals or coke to the extent of about one-half of the total production, which, in 1850, reached 130,000 tons. The other half is produced with charcoal, the best being made in the Rhenish provinces, one half of the surface of which is still covered with woods. The whole of this quantity, which is small enough for a population of 20,000,000, is consumed in the country, with the exception of a small portion exported as steel. The high prices of iron have hitherto allowed the producer of charcoal iron rather to endeavor to compete with coke iron in domestic uses of the metal, than lead him to improve its quality, so as to rival the bars of Sweden and of Russia. The demand, however, for fine charcoal iron for steel and parts of machinery, must necessarily increase with the growing production and cheapening of coals, which enable machines to supersede hand-labor.

AMOUNT OF COAL SENT FROM THE CUMBERLAND COAL REGION.

We are indebted to a friend for the following statistics taken on the spot, in which will be found the amount of coal sent from the Cumberland Coal Region from July, 1846, to July, 1853. The amount estimated for 1853 is 500,000 tons. It is only seven years since the first shipment was made, and the progress in that period is more rapid than from any other district in the country. The Lehigh mines, which were opened in 1820, sent to market in 1845, 430,993 tons. The Lackawanna opened in 1829, sent to market in 1848, 434,267 tons. At that period, however, coal was a new article of fuel.

A large amount of capital has been invested in the Cumberland region during the present year, and the effect must be to push up this trade very rapidly. Some, even, predict that it will, in a few years, divide the market with the anthracite coal from Pennsylvania.

STATEMENT OF THE QUANTITY OF COAL FORWARDED FROM THE CUMBERLAND, MARYLAND, COAL REGION, FROM JULY 1, 1846, TO JULY 1, 1853.

Period.	From Jennings' Run Valley.	From Braddock's Run Valley.	From George's Creek Valley.	Total.
	Tons.	Tons.	Tons.	Tons.
6 months, 1846	5,437	6,321		11,758
1847	20,615	32,325		52,940
1848	36,571	43,000		79,571
1849	63,676	78,773		142,449
1850	76,950	119,898		196,848
1851	122,331	135,348		257,679
1852	174,891	159,287		334,178
6 months, 1853	114,701	87,275	9,500	211,476
	615,172	662,227	9,500	1,286,899

On the completion of the double track of the Baltimore and Ohio Railroad, the facilities for forwarding this coal will be very greatly increased. This work is progressing rapidly.

COALS IN ENGLAND.

The annual weight of coals raised in England is estimated at 35,000,000, or taking the ton of coal as equal to about a cubic yard. more than eleven square miles of a bed of coal three feet thick, supposing the whole coal removed.

THE COAL FIELDS OF EUROPE.

The beds with which the coal is generally associated in the British islands, are various sands and shales (imperfect slaty beds) of different degrees of hardness; but the actual coal seams themselves often repose directly on clay of peculiar fineness, well adapted for fire-bricks, and generally called under clay. The under clay is used in many coal districts for various purposes of pottery. Bands of ironstone (impure argillaceous carbonate of iron) are very abundant in certain coal districts, but are almost absent in others. The Scotch coal fields near Glasgow, the South Welsh. and some others, are rich in ironstone, which is the chief source of the vast quantities of iron manufactured in the kingdom.

The principal coal fields of Europe, apart from the British islands, are those of France, Belgium, Spain (in the Asturias), Germany (on the Ruhr and Saare), Bohemia, Silesia, and Russia (on the Donetz). Of these the Belgian are the most important, and occupy two districts, that of Liége and that of Hainault, the former containing 100,000 and the latter 200,000 acres. In each the number of coal seams is very considerable, but the beds are thin, and so much disturbed as to require special modes of working. The quality of coal is very various, including one peculiar kind, the Flenu coal, unlike any found in Great Britain, except at Swansea. It burns rapidly, with much flame and smoke, not giving out an intense heat, and having a somewhat disagreeable smell. There are nearly fifty seams of this coal in the Mons district. No iron has been found with the coal of Belgium.

The most important coal fields of France are those of the basin of Loire, and those of St. Etienne are the best known and largest, comprising about 50,000 acres. In this basin are eighteen beds of bituminous coal, and in the immediate neighborhood several smaller basins containing anthracite. Other valuable localities are in Alsace, several in Burgundy, much worked by very deep pits, and of considerable extent; some in Auvergne with coal of various qualities; some in Languedoc and Provence with good coal; others at Arveyron; others at Limosin; and some in Normandy. Besides these are several others of smaller dimensions and less extent, whose resources have not yet been developed. The total area of coal in France has not been ascertained, but is probably not less than 2000 square miles. The annual production is now at least 4,000,000 tons.

There are four coal districts in Germany of the carboniferous period, besides several districts where more modern lignites occur. The principal localities for true coal are near the banks of the Rhine in Westphalia; on the Saare, a tributary of the Moselle; in Bohemia and in Silesia, the total annual production exceeds 2,750,000 tons.

Of these various localities, Silesia contains very valuable and extensive deposits of coal, which are as yet but little worked. The quality is chiefly bituminous, the beds few in number but very thick, amounting in some cases to 20 feet. Some anthracite is found. Bohemia is even more richly provided than Silesia, the coal measures covering a considerable area, and occupying several basins. More than 40 seams of coal are worked, and several of these are from 4 to 6 feet thick.

The basin of the Saare, a tributary of the Moselle, near the frontier of France, affords a very important and extensive coal field, which has been a good deal worked, and is capable of great improvement. No less than 103 beds are described, the thickness varying from 18 inches to 15 feet. It is estimated that at the present rate of extraction the basin contains a supply for 60,000 years. On the banks of the Rhur, a small tributary to the Rhine,

entering that river near Dusseldorf, there is another small coal field estimated to yield annually 1,000,000 tons.

Hungary, and other countries in the east of Europe, contain true coal measures of the carboniferous period; but the resources of these districts are not at present developed. On the banks of the Donetz in Russia, coal is worked to some extent, and is of excellent quality, but it belongs to the other part of the carboniferous period.

Spain contains a large quantity of coal, both bituminous and anthracite. The richest beds are in Asturias, and the measures are so broken and altered as to be worked by almost vertical shafts through the beds themselves. In one place, upwards of 11 distinct seams have been worked, the thickest of which is nearly 14 feet. The exact area is not known, but it has been estimated by a French engineer, that about 12,000,000 of tons might be readily extracted from one property without touching the portion existing at great depths. In several parts of the province the coal is now worked, and the measures seem to resemble those of the coal districts generally. The whole coal area is said to be the largest in Europe, presenting upwards of 1,000 workable seams varying from 3 to 12 feet in thickness.

IRON AND ZINC.

MANUFACTURE OF IRON FROM LAKE SUPERIOR ORES.

To W. J. Tenney, *Editor of the Mining Magazine.*

I will give you my impressions regarding the iron region and the manufacture of iron from the Lake superior ores, though I have hitherto avoided giving publicity to opinions opposed as mine have always been to the popular and extravagant statements, that have been spread abroad through the papers on this subject.

The Lake Superior iron ores belong to the variety of ores known as *specular iron*—a combination of iron and oxygen, of which the metallic proportion *cannot* exceed by weight seventy-two and a small fraction per centum. *Magnetic iron ore* accompanies the specular, and the two are frequently mixed. The greatest proportion of iron ever obtained from this mixture cannot exceed seventy-five per centum. No reliable analysis of the Lake Superior ores has ever given so high a yield as this. Statements of a greater yield prove their own falsity, and the ignorance of the operator. Such ores are *not peculiar* to the Lake Superior region. They are almost or quite as abundant in Missouri; and similar ores are extensively worked on the shores of Lake Champlain; in Orange co., New-York, and in New Jersey. New Hampshire and Georgia, both contain in mountain masses varieties little differing from them. Some of the Andover ore of New Jersey cannot be distinguished from the choicest of the Lake Superior ores; and if made into bar iron direct, with the same care as were the samples for trial prepared from this ore, there is no question but it would exhibit the same remarkable strength; the pig-iron manufactured from it, though made with anthracite, possesses the strength of the best charcoal iron.

Being very free from earthy matters, these ores are well adapted for working in bloomery fires. They require a preparatory roasting, stamping and screening, by which they are subjected to some loss, and finally yield about a ton of metallic iron to two of ore as taken from the mine. More or less is lost in the cinder, according to the skill of the workmen, the purity of the ores and the adaptedness of the apparatus.

The bloomery process is a convenient one, where the ores are of this rich character, and charcoal is abundant. The charcoal made from the hard maple

and birch of this region, is especially well adapted for this process. It is of remarkable soundness and density, owing to the great hardness of the wood. The same cause adds materially, however, to its cost. Each bloomery fire, worked by two bloomers and two ordinary workmen, turns out about a ton of blooms in twenty-four hours. The wages amount to eight dollars, and the consumption of coal, including waste, and all really *paid for*, can seldom be estimated at much less than 300 bushels. Of the charcoal, such as I saw at the works, 250 bushels ought to be enough. The expenses of manufacture may then be estimated as follows:—

Estimated cost of a ton of blooms made on the Lake Shore.

2 tons of ore, quarrying and hauling 12 miles, at $2	$4 00
Roasting same, at $1	2 00
Stamping and screening, at 50c.	1 00
250 bush. Charcoal, at 8c. (actual cost)	20 00
2 bloomers at $3, 2 helpers at $1, or same amount as by actual contract	8 00
Repairs $1, Superintendence $1, Interest $1	3 00
General expenses	2 00
Cost on Lake Shore	$40 00
Shipping, freight, carting, storage and commission, say	15 00
Cost when sold at Cleveland	$55 00

This cost calculated upon a small operation, with large allowance for transportation, *may be* considerably reduced by running twenty or thirty fires in the same establishment, and by the construction of a rail or plank road from the mines to the Lake shore. But there are several points requiring careful consideration before one could be justified in pronouncing upon the success of such an undertaking. In the first place, no business is so wholly in the hands of skilful workmen as that of manufacturing blooms. For every ton made in twenty-four hours, two men are required, who have served a regular apprenticeship, and acquired their ability only by long practice. Their places cannot be filled with men picked up any where. The success of the business is dependent wholly upon their skill and good will. Strikes are common among them, and are frequently disastrous to the works. This is especially to be feared in a remote district, shut off a large portion of the year from all communication with other places where this manufacture is carried on. It is probable that this cause, more than any other, has kept back the spread of large bloomeries in New-York and New Jersey, and limited the business, with few exceptions, to small works, conducted by the proprietors, who were once bloomers themselves.

Again to carry on a large establishment, powerful machinery is required, and this must be kept in steady running order. But such machinery is liable to accidents and breakages, to repair which recourse must be had to complete machine shops, foundries and large forges. Now these must either be provided at the works, and competent mechanics kept employed at them, or delays of a whole winter may be involved.

Then again, for six or seven months in the year the products of the works are accumulating without a possibility of getting them to market. Opportunities are lost of taking advantage of high prices. The capital lying dead, adds materially to the expenses.

Such considerations as these, together with others arising from the great expenses of introducing and supporting the population required for carrying on this business at Lake Superior, have led me to look with incredulity upon the large estimates of profits to arise so soon from the manufacture of blooms in this region.

Still I am very far from questioning the great value of these rich ores—with few exceptions the only iron ores from the country east of the Alleghanies to the Mississippi River, north of Tennessee, that have been or will be dis

covered, suitable for the manufacture of the best boiler-plate iron, wire, car-axles, car-wheels, and other work of refined or cast-iron, requiring the greatest strength. The demand for them will be immense. The great Lakes already draw enormous supplies of iron from the eastern portion of the Atlantic States; much of the best of it, after it has passed through the mills at Pittsburg, and been mixed and deteriorated with the poorer western iron; some of its supplies have crossed the Atlantic, and in the state of Scotch pig finds no serious competition in Wisconsin and Illinois, after having passed around a fourth of the circumference of the globe. The Lake Superior mines are destined to change the course of this trade, and supply better iron than is now generally found about the great Lakes. But can this be done by a process which requires the slow labor of four men to make a ton of iron in twenty-four hours, besides all those employed in the various other departments of the work? For many purposes, iron made direct from the ore will be preferred to that first made into pig-iron and then refined; and the comparatively small quantity so prepared will find a profitable sale in a prosperous state of the iron market. But the great demands of the trade must be met, as they are now, by iron produced from blast furnaces. It is the establishment of these, judiciously located, in connection with large rolling mills, forges, nail factories, &c., that will first really develope the resources of the iron region, and realize the profits that its mines are capable of producing.

To work these ores successfully in the blast furnace, they require mixing with other leaner ores. It may be there are varieties in the same region, that will bring down the percentage of the whole to about 50 of cast iron, and afford the materials (with such limestone as is already discovered in the country, or may be carried there as return freight) for a fluid-running, glassy cinder—the first requisite in making pig-iron. It is more likely the country below can furnish a better variety of these poorer materials. In the same way the ores of Lake Champlain are now most advantageously worked on the Hudson River, where they meet other primary ores from the Highlands and the hematites of Massachusetts and Connecticut.

By the mixture, made with judgment, the objectionable qualities of one kind are neutralized by the opposite qualities of the others, which by themselves would be equally objectionable.

In this way the poor ores are made profitable, and produce good iron. So the bog ores of lower Michigan and Ohio, and the clay iron-stones of the coal formation may be turned to good account worked with the rich ores of Lake Superior; and according to the different mixtures many desirable varieties of iron may be obtained.

The canal past the Saut once completed, the expense of transporting the ore below to be there smelted, seems to be of little moment in comparison with the expenses and difficulties consequent on the running of blast furnaces in the upper country. These in their present improved construction and heavy machinery, are still more dependent than bloomeries for their uninterrupted running, which is essential to their success, on convenient access to machine shops. This is one reason why they are now more generally found close to large cities, than as formerly in remote districts, near the mines. Here, too, the works are at all times sure of workmen, and the proprietors are not compelled to clear lands, build houses, cultivate farms, and import stock and other supplies for their support. At all times they are under the eye and control of the parties interested. The products of the works are at once in the market, and they are varied to meet the immediate demand. This ability to fill orders is almost as essential for the complete success of blast furnaces as of rolling mills. It is not improbable that the additional cost of transportation of ore (to Detroit for instance), would be more than met by the cheapness of charcoal, which must always be obtained on the shores of the lower lakes. In Baltimore there are seven or eight blast furnaces, all of which are supplied with fuel brought to them from the wooded country around Chesapeake Bay. Lake St. Clair, in

this respect, is to Detroit what the Chesapeake is to Baltimore. Wood to both is furnished for about two dollars per cord and no fears need be entertained that the supplies will ever be exhausted. The wood is brought to the furnace dock and charred in kilns containing from fifty to sixty cords each. At two dollars per cord, charcoal will cost, thus prepared, less than six cents per bushel. The vast country supplying the wood keeps up a healthy competition; the supplies are certain, and there is little variation in the prices. To one familiar with charcoal furnaces and the great difficulty of stocking them, this will present itself as a consideration of the highest importance. It would certainly debar any prudent man from rashly attempting to make pig-iron in the lake country, with its present population.

At all well managed blast furnaces, it is customary to keep a large stock of ore on hand. It is benefited by lying a year or more exposed to the weather. There is hence no unnecessary use of capital in getting down during the summer the ore for a year or more, as there is in keeping a winter's stock of iron on hand in the upper country.

Many people have a mistaken notion that the best iron can only be made direct from the ore; others, that charcoal iron made with *cold* blast is the only pig-iron suitable for making the strongest refined iron. Yet the hot-blast iron of the Housatonic valley has always found a good market at the forges where car-axles are made, and it is selected for the bars which Collins orders for his axes, and which, perhaps, are as carefully scrutinized and subjected to as severe tests as iron for any other purposes. And so great are the modern improvements in the manufacture of pig-iron, even that made with *anthracite* from the Andover ores and puddled, produces bar iron little inferior to the best charcoal blooms. There can, therefore, be no reasonable objection to working the Lake Superior ores in charcoal blast furnaces, on the score of their making poorer iron. Though success has not attended the attempts to use our bituminous coals for making pig-iron on a large scale, there is more reason in looking to these as the fuel that will probably be hereafter employed for the reduction of the Lake Superior ores, than now to find fault with charcoal furnaces.

As the iron business is now conducted, the profits of the smaller establishments bear no comparison with those laid out on a liberal scale—supplied with the most thorough machinery, and of the latest and most approved designs. The size of the furnaces has greatly increased the last few years, and the production of some of them has far exceeded in proportion, their increased capacity. —At Hudson, N. Y., are two anthracite furnaces of 16 feet across the boshes, which make over 180 tons, each one, of pig-iron per week. The manager of these works, C. C. Alger, Esq., has probably produced the greatest results in proportion to their size with these furnaces of any in the world. His success with the Stockbridge charcoal blast furnace, of ten feet bosh, was almost as remarkable, running it repeatedly at the rate of 90 tons per week. The two furnaces of Messrs. Cooper & Hewitt, which are run with the Andover ores, are twenty feet across the boshes, and have produced about 220 tons each per week. These great results are ascribed mostly to a steady and efficient blast, of much greater pressure than has ever before been used.—The machinery to obtain this requires a large outlay of capital. The two furnaces at Hudson complete cost about $175,000, and the other two somewhat over this sum.

Charcoal furnaces would be considerably less expensive, but though it might be expedient to begin with only one or two, an engine and blowing apparatus ought to be provided sufficient for a larger number. The cost of manufacture, supposing there are two furnaces of the most approved construction located at Detroit, should not vary materially from the following estimate, the company being supposed to own the mine, as in the former estimate of the cost of blooms:

Estimated cost of making Charcoal Pig Iron at Detroit, in large blast furnaces, railroad to the mines, and canal built.

1¾ tons of ore at $4	$7 00
130 bush. charcoal at 4c. . . .	5 20
Flux 50c. labor $2 . . .	2 50
Repairs 50c. superintendence 50c.	1 00
Interest, general expenses . .	1 00
	$16 70

Having written already much more than I intended, I will leave it for others to calculate the cost of puddling this iron and rolling it into bars, and to determine the extent and cost of refineries that should be added to the furnaces. One point only of interest I would not fail to call attention to.

On the Island of Elba are found large bodies of ore similar to those of Lake Superior. The furnaces for smelting them are on the opposite shore of Tuscany. They are small, and of very peculiar construction, different from any other furnaces, but by their extraordinary yield they have proved to be extremely well adapted for smelting this kind of ore.

ON THE USE OF BURNT LIME INSTEAD OF LIMESTONE AS A FLUX IN BLAST-FURNACES. BY E. MONTEFIORE-LEVI AND DR. EMIL SCHMIDT.

The study of the gases formed in blast-furnaces, with which these authors have been engaged for some years, has shown that the use of carbonate of lime as a flux is attended with great loss, and likewise that this loss may be obviated by using burnt lime instead. The gases were taken from a blast-furnace, 54 feet high, at Ougrée, at thirty-two places, 1 foot apart, and the percentage of carbonic acid determined.

According to calculation, 8000 kilogrms. carbonic acid require for conversion into carbonic oxide 2173 kilogrms. of carbon, and the quantity of heat developed in the combination of this quantity of carbon with 1 equiv. of oxygen, is 2173·1386=3,011,778 heat units. At the same time, however, these 8000 kilogrms. of carbonic acid are reduced to 5092 kilogrms. of carbonic oxide by the action of the carbon, a change which is accompanied by the absorption of a quantity of heat equal to that developed by the combustion of the latter gas, *i. e.*, 5092·2488=12,667,896 heat units. Consequently, deducting the 3,011,778 heat units developed in the oxidation of carbon from the total number of heat units absorbed in the reduction of carbonic acid to carbonic oxide, there still remains a loss of temperature equal to 9,656,118 heat units, equivalent to the heat developed by the combustion of 1609 kilogrms. of coke.

These considerations led the authors to employ burnt lime in working blast-furnaces, and thus to obviate the loss of heat. The experiment was commenced at Ougrée in July, 1849. During the first few days the results were unsatisfactory, the management of the furnace was difficult, and the slags black and pasty. Subsequently, when taking into account the impurities of ordinary limestone, 63 parts of burnt lime were substituted for 100 parts of limestone: the working of the furnace, until it was let out at the beginning of 1851, was continually regular and good; during these eighteen months the most satisfactory results were obtained. The saving of coke and increase of production were, as the experimenters anticipated, very evident; moreover, the raw iron was of better quality, and all the interior parts of the furnace, especially the tymp stone, remained in a much better state of preservation than when limestone was used. The following table gives the quantities of coke consumed, in the production of 100 kilogrms. raw iron, in the above-mentioned furnace, during the four months before and the four after the alteration of the charging, all other conditions remaining the same:

	With limestone.			With burnt lime.	
1849.	March . .	150·0 kilogr.	1849.	July . .	142 kilogr.
	April . . .	145·5 "		August . . .	138 "
	May . . .	156·5 "		September .	133 "
	June . . .	151·5 "		October . . .	139 "
Average quantity .		153·2 kilogr.	Average quantity . .		137·75 kilogr.

Average quantity consumed with limestone . .	153·20 or 100	p. c. coke.
Average quantity consumed with burnt lime . .	137·75 or 90	p. c. coke.
Difference	15·45 or 10	per cent.

The practical saving is therefore 10 per cent., which corresponds tolerably well with the theoretical result.

The experiment was repeated in 1850, in a second blast-furnace, with the same favorable result of increased production, saving of fuel, and easier working. The following table shows the quantity of coke consumed for every 100 kilogrms. of raw iron, and the production during the first six months (reckoned at twenty-eight days). The figures in the first column refer to the furnace in which limestone alone was used; the second column to the first-mentioned furnace, in which burnt lime alone was used; and the third column to the second furnace, in which limestone was used for three months, and burnt lime for the next three months. All three furnaces are constructed alike, smelt the same ore, and produce the same kind of iron:

	Quantity of Coke in Kilogr. consumed for 100 Kilogrammes raw iron.			Reduction during Twenty-eight Days in Kilogrammes.		
	1. With Limestone	2. With Burnt lime	3. With Limestone	1. With Limestone.	2. With Burnt lime.	3. With Limestone.
April	165	145	163	436,000	601,000	459,000
May	165	147	159	447,000	582,000	461,000
June	160	147½	164	477,000	588,000	483,000
			With Burnt lime			With Burnt lime
July	161	146½	149¾	462,000	555,000	587,000
August	158¾	145	146	465,000	586,000	552,000
September	158	147¾	146	477,000	577,000	600,090
Mean	160½	146½	154¾	461,[illegible]00	578,000	516,000
Average from April to June	....	....	162	....	....	4[illegible]9,000
Average from July to Sept.	....	....	147½	....	....	568,000

The very regular and uniform results given in this table, show that by the use of burnt lime the consumption of coke for every 100 kilogrms. of raw iron was reduced by 14 to 15½ kilogrms., while at the same time the production of iron increased within a certain period as much as 22 or 24 per cent.

Hitherto the opinion of metallurgists with regard to the use of burnt lime was rather unfavorable than otherwise; but since the above experiments were made at Ougrée, it has been employed with good results in England and Wales, among other places at Abershyne, where the results obtained were still more satisfactory than at Ougrée, inasmuch as the saving of coke effected by this means amounted to 13 kilogrms. for every 100 kilogrms. of limestone which was replaced by 63 kilogrms. of burnt lime.

New lime-kilns have recently been built at Ougrée; burnt lime has been employed there two years and a half, and with uniform results, for which reason the authors recommend its general application, from a thorough conviction of the advantage to be gained. The entire saving, inclusive of the expense of burning the limestone, is stated by them to amount to 30,000 francs annually for each furnace.—*Zeitschrift des österr. Ingenieurvereines*, 1852, p. 145–150. Translated for the Polytechnic Journal.

THE IRON MANUFACTURE OF GREAT BRITAIN.

The produce of the iron manufacture of Great Britain in 1750, was only about 30,000 tons; in 1800 it had increased to 180,000 tons; in 1825 to 600,000; and in 1832 the product of pig-iron was estimated at 2,701,000 tons. This estimate of the yield was made only upon those furnaces in blast, as follows:—

	Furnaces. In.	Out.	Total.	Pig Iron. Tons.
Scotland	113	31	144	775,000
South Wales	185	27	152	685,000
Ditto Anthracite	12	23	35	31,000
South Staffordshire	127	32	159	725,000
North Staffordshire	17	4	21	90,000
North Wales	6	7	13	30,000
Shropshire	27	13	40	120,000
Durham	18	8	26	110,000
Northumberland	7	6	13	35,000
Yorkshire and Derbyshire	35	7	42	150,000
Total	497	158	645	2,701,000

The shipments of pig iron from Scotland to the United States for the last seven years, have been as follows:—

1846	13,918 tons	1850	57,509 tons
1847	44,994 "	1851	80,019 "
1848	90,235 "	1852	100,700 "
1849	94,212 "		

The shipments of manufactured iron from Liverpool to New-York, Boston and Philadelphia during the last seven years, have been as follows:—

	Rails. Tons.	Bars, &c. Tons.	Hoops, &c. Tons.	Total Tons.
1846	12,514	12,807	1,686	27,007
1847	12,635	37,543	7,195	57,373
1848	50,188	33,621	7,237	94,046
1849	33,849	57,136	13,203	104,187
1850	29,808	66,338	19,486	115,632
1851	78,199	64,301	19,293	161,793
1852	74,468	72,064	22,196	168,728

Of which during the year 1852, New York received 135,290 tons: Boston 24,414 tons, and Philadelphia the balance.

MANUFACTURE OF WROUGHT-IRON DIRECT FROM THE ORE.

A brief report was made in the last number of the *Mining Magazine* (Vol. I. No. 2) respecting the establishment of Messrs. Davis of Cincinnati, for the manufacture of wrought-iron direct from the ore. The process adopted is that of James Renton, of Newark, New Jersey. The ore is taken in its raw state, and after being stamped, and prepared by an admixture of carbon, it is put in a series of close tubes, placed in a chamber, the outer surface of the tubes being exposed to the waste heat of the furnace for several hours, when it is sufficiently deoxydized. It is then discharged, as required, into the furnace, where it is readily worked up into balls weighing about one hundred pounds, and taken to the hammer, averaging two balls every hour. The process is continuous and uniform.

A company with a large capital has been successfully carrying on this process at Newark for a considerable time. Their iron has been introduced for manufactures, and with high commendation. We have seen their works in operation.

The cheapness of the process is worthy of attention. The following is a statement of the cost of a ton of blooms at Newark, with one furnace:—

From two to two and a half tons of ore, at $4,	$10 00
One and a half tons of coal, at $4 25,	6 38
Puddling and welding, per ton,	5 00
Hammering, "	1 50
Labor, "	3 00
Coal for carbon,	1 25
Half ton of coal for engine, at $4,	2 00
Making the cost of a ton of blooms about	$29 63

Any description of fuel—wood or coal, both anthracite and bituminous, can be employed for heating the furnace, and with nearly equal advantage.

QUARRIES AND CLAYS.

PORCELAIN—ITS MANUFACTURES, AND ITS APPEARANCE IN THE AMERICAN EXHIBITION.

Porcelain may be regarded as the most perfect condition of the manufactures of clay; in fact, there has been but little improvement in the art for a long period. The demonstration of porcelain manufactures is, as yet, imperfect in the Exhibition in the city. Such as it is, however, with many interesting facts connected with its manufacture, we find so well described in the New-York Tribune, that we have made the following extracts, as within the scope of the *Mining Magazine*:—

The formation of earthen vessels, or the *ceramic* art, divides itself into two branches: that of pottery, as it is commonly termed, and that of chinaware. There is not so much difference in the materials employed in each branch, as in the manner of treating them; the material for porcelain being semi-fused, and thus more nearly approaching in its nature to glass. It is curious to see, by the articles exhibited, how zealously these two branches have been cultivated by rival nations; the excellence of the British department being in the articles of *delf* or common household ware, while the taste and skill of France has been devoted to the perfection of porcelain. The show of these articles lies chiefly with these two nations, for the samples of ware fabricated in this continent are few, and not of a high degree of perfection. It cannot be said to be an indigenous art; although Vermont and the other New-England States, as well as New-York, furnish an abundance of very pure materials. The wealth to patronize extensively exists here, perhaps, but the skill to execute is yet a desideratum. Nor is this absence of manufacture peculiar to our people. If we put aside the Chinese, there are but three nations who can export pottery to any extent; first, England, then France, and lastly, Germany.

The fabrication of porcelain is an art, half chemical, half mechanical. Transferred from China, to which by prescriptive right it belonged, it has been imitated as an art in Central Europe with little advancement byond the Asiatic originals. It is not a century since the strangest views were entertained respecting the composition and nature of chinaware. Reaumur proved that the mixture of two peculiar earths found in China, called *petun-tse and kaolin*, produced porcelain. The next step in advance was to discover if any earths similar to these existed in Europe. The Jesuit, Francis Xavier d'Entrecolles, who was residing as missionary in China, contrived to elude the jealous vigilance exercised toward strangers, and not only forwarded to France the specimens of the earths, but also the knowledge of the manufacture, which he had acquired. They were, however, worthless, owing to his want of practical intelligence. Much about the same time, Baron de Botticher, a German alchemist, established the porcelain manufacture in Saxony, by accident. While following out some vain researches for the philosopher's stone, he prepared some crucibles, and having burned the clay over much, he observed it had all the characters of Oriental porcelain. He saw the importance of this real discovery, and, abandoning alchemy, he commenced the manufacture of Dresden porcelain. The secrecy attempted in the processes could not be retained, and with the partial knowledge and national rivalry, the establishments of St. Cloud and the Faubourg St. Antoine were commenced about 1719. White porcelain only was manufactured in these places; they were of beautiful appearance externally, but wanting in all that constitutes good china.

The manufactory at Sevres, in France, was started and maintained under Royal auspices, and the works there produced specimens of art which vied successfully with Dresden and China. When Frederick the Great conquered

Saxony, he forcibly carried away several of the best workmen from the manufactory at Meissen, near Dresden, and conveyed them to Berlin, where, since that time, a considerable manufacture has been carried on. As many as five hundred men are employed in the Royal Prussian establishment; but the quality of the porcelain fabricated has never equalled that of Dresden.

The manufacture of coarse earthenware in Staffordshire, England, goes as far back as the time of the Romans. In the year 1690, two brothers, named Elers, from Nuremberg, settled at Bradwell, where they made an improved red ware, and introduced the glazing of the vessels, by throwing common salt into the oven. Jealousy succeeded in driving these two men out of the country, after the secret was stolen from them. Astbury succeeded them in the manufacture, and introduced a white stone ware, which, it is said, accident brought under his notice. In travelling on horseback to London, his horse's eyes became attacked with some disorder; an ostler of the inn where he stopped, cured them by burning a flint, and reducing it to a fine powder before he blew it into the horse's eye. The potter, observing the beautlful white color of the calcined flint, immediately saw how it might be applied as an ingredient in his own business. This step in advance, led the way to the improvements of Isaiah Wedgewood, with whose name this beautiful art, in England, is indissolubly linked. Of the seven various kinds of ware introduced by him, two are of especial value: one, his table-ware, or Queen's-ware, as it is commonly called, and the porcelain biscuit, or Wedgewood ware, of which mortars and other chemical utensils are made. These inventions of Wedgewood showed that porcelain could be made in England. Cookworthy discovered the earths in Cornwall, and having secured to himself, by patent, the exclusive right of using these materials, was the first person who made true porcelain in that country. This was in 1768. It is now manufactured at Derby, Coalport in Shropshire, Worcester, and Swinton in Yorkshire.

Porcelain is a mixture of earths, which, by subsequent heating, is semi-fused. Reaumur's experiments show this clearly; he took the two earths from China, called Petun-tse and Kaolin, made a small cake of each substance, and exposed them to the heat of a strong furnace; the petun-tse was fused by this means without any addition, while the other, the kaolin, gave no signs of fusion. He then intimately mixed them both, and found, when the mixture was baked, that it had acquired all the qualities of the finest Chinese ware. It is thus a mixture of an earth, which is fusible by heat (petun-tse), and one which is infusible (kaolin); the whole being semi-vitrified, becomes partially transparent. Porcelain stands intermediate between pottery and glass; were it wholly infusible, it would be earthenware; were both materials fusible, it would be glass.

These two earths are obtained in China, and are produced by the decomposition of granite. Latterly, in some instances, the Chinese use a coarse granite, in which the crystals of felspar are large (pegmatite), which they reduce to powder, form into shapes, and submit to the furnace, and from which a very good porcelain is made. Mr. Ebelman, a distinguished chemist, and director of the porcelain works at Sevres, has made a series of experiments on the materials used at present by the Chinese, which are of great value to the manufacturers. Kaolin is a very fine clay, or silicate of alumina, which the shores of Lake Champlain, both on the New-York and Vermont side, abundantly supply. It is also found in every New-England State, and in the valleys of districts surrounded by granite rocks. It is derived from the action of the atmosphere upon the mineral felspar. Petun-tse is the fine silicious matter of the granite rocks, and is in all other countries, except China, superseded by ground flint, or opaque quartz in very fine dust. These materials are ground to impalpable dust, made into a cream with water, some calcined bone added, and the water is then evaporated off until the mixture has the solidity suitable for working it into shapes. It is then placed upon the wheel and lathe to be turned into form. Sometimes it is pressed into shape in

plaster moulds. It is then placed in the ovens or biscuit kilns to be fired. Here it must neither be soiled nor overheated. To avoid these, it is inclosed in "seggars," or earthen vessels. After being baked it is gradually cooled, and appears as what is termed "biscuit ware," being of a soft, dead-white, delicate appearance. It is then glazed by dipping the articles into a vessel of water, containing the materials of glass in a pulpy state. When coated with this they are replaced in the oven to be fired a second time, by which the glass materials are melted, and a thin varnish of glass is thus spread over the outside of the ware. It is subsequently painted, gilded and enamelled, by beautiful processes. It is now that finished and *recherche* article, of which there are exquisite specimens in the Exhibition.

Of the porcelain at present unpacked, the large majority is in the French and British departments.

In the former the collection of L. Andre Pilliougt & Co. deserves inspection; the assortment of colored and gilt china dinner service and vases; a dessert service of low comporter pattern; a toilet set in blue and gold, with flowers, are among the beautiful contributions from this establishment. In the article of vases and in fancy porcelain there is nothing in the palace which approaches the specimens shown by Messrs. Haviland & Co., of Limoges, and John st. in this city; the large size of these ornaments, the beauty of the coloring, clearness of the picture, and the chasteness of the designs, place them in the first rank. The representation of the dancing girl from Victor Hugo's novel of *Notre Dame*, is well executed on the body of the vases. The collection consists of a centre piece, two larger and four smaller vases, and a dinner service in pink and gold.

Rees & Co., of Limoges, exhibit specimens of their ware. With the exception of one noble vase, the articles are not of the first quality; a collection of Parian statuary is upon this stand.

In the English department, Sampson Bridgewood & Son, of Staffordshire, exhibit a good collection of delf and soft china. Ridgeway, of Staffordshire, has a collection of gilt china. It may be stated here that the English porcelain is almost always what is termed *soft* porcelain, or made of materials which melt or form a semi-fused mass at a lower temperature than those manufactured in France. This is due to the employment of bones by the British manufacturers, which give a kind of semi-transparent enamel; this compensates to some extent for the incomplete fusion of the clay in the British porcelain. From this it may be perceived that French porcelain, as a ware, is a superior article, quite independent of the superior taste exhibited in the ornamentation.

Rose & Co., of Coalport, Shropshire, have an extensive collection of gilt and vari-colored china, in dinner and tea services, urns, vases, pitchers. Some jewelled vases and some with two-necked swans are of great beauty; a Queen's pattern vase, painted and gilt, is an object worth inspecting. This collection eminently displays the superiority of Great Britain in the design and manufacture of domestic wares, which do not imply elaborate design and ornament. Minton & Co., Stoke upon Trent, occupy a very respectable position in the Exhibition. Among the most prominent articles in their collection is a dessert service of great beauty; it is a combination of statuary porcelain, which is of the hard kind, with the gilded and colored porcelain, which is of the soft kind. The ground of turquoise almost approaches that on the old Sevres. The service consists of 116 pieces. They are flower-stands, with figures emblematic of the seasons; wine-coolers, with hunting groups; oval baskets, with eastern figures; many of the pieces are supported by Parisian figures. The plates (six dozen) are perforated and highly ornamented, each differently. Queen Victoria purchased the original collection (of which this is duplicate) for 1,000 guineas, and made a present of it to the Emperor of Austria.

The most useful articles in Minton's collection are the samples of encaustic Venetian and other ornamental tiles for flooring. These pavements are now

used in the flooring of churches and other buildings in this city and elsewhere on this continent. The encaustic tiles are made from the wet or slip clay, pressed into blocks, and faced with a finer clay, colored to the desired tint. The whole is then put in a box-press, and a plaster slab, containing the pattern in relief, brought down with force upon the face of the tile: upon this deeply indented surface, clay, in a semi-fluid state, is poured. This clay is generally of a deep color, and after lying twenty-four hours on the tile, becomes hard. The superfluous clay is scraped off, and the surface mechanically cleaned and smoothed, and the tile is then baked in the oven. The process is almost similar to the mediæval one, and Mr. Minton is entitled to the credit of having revived it with increased beauty and utility.

The Mosaics are made from stained dry clays, which are pressed and baked, and afterwards formed into moulds by mixing with plaster or Roman cement. The variety of uses and the beauty of patterns are well shown in Minton's collection, which consists of slabs for fireplaces, jambs, and other branches of house-ornament. The pressure exercised to form these dry tiles is immense, being, in the steam machine working by Prosser's patent, equal to 400 tons. Each machine can make 5,000 tiles an hour, and but one man is required to take out the finished article. A Council Medal was awarded to Messrs. Minton in the London Exhibition. M. & Co. have also a collection of Parian figures of great variety and excellence.

The introduction of statuary porcelain, or Parian figures, is a branch of porcelain manufacture in which Great Britain has advanced beyond France and Germany. This imitation of marble was originated in Alderman Copeland's works (Stoke upon Trent) early in 1842. It is now fabricated in almost all the factories of Staffordshire, but excellence in the finish, and beauty in artistic design is still held by Mr. Copeland, and the collection of Parian statuettes on his tables are the gems of their kind in the Exhibition. Parian material is a porcelain in which a soft felspar is used instead of the more silicious Cornwall stone. The dulness of the tint, which adds to its beauty, is due to a little oxyde of iron accidentally present in the clay. This uniting with the silica of the clay, forms a silicate of peroxide of iron of a light yellow color. These figures, instead of being pressed into moulds as in the case of porcelain, are cast with the materials, in a liquid state, or plaster with water. As all clays contract in drying, when these are fired they contract as much as one-fourth, and what is more difficult to manage, they contract unequally, in proportion to the mass of material in different parts of the figure. Hence dexterity and a knowledge of the human form is requisite, as the subjects are cast in separate pieces, and have to be united afterwards by a skilful artist. Besides the beauty of this kind of biscuit ware, the fidelity with which the *chef d'œuvres* of sculptors are copied by Copeland enhances the value of this collection. Among the fine statuettes, we may mention the groups of the "Prodigal Son," an imitation of a Cellini vase, "The Struggle for the Heart," consisting of two Cupids from Fiamingo, "Ino and Bacchus," from the original marble of Foley, the reduction being effected by Cheverton's process,—a very pretty group, 24 inches high; "The Return from the Vintage," a fine group of seven figures, 26 inches high; "The Love Story" and "Paul and Virginia," two small groups; "Eve Tempted," is a beautiful design, the apple being presented in the serpent's mouth; and the four Children of Queen Victoria emblematizing the four seasons, after Mrs. Thorneycroft's originals. Besides, there are some fine chivalric groups. In the same ware is a complete tea service which appears to us a very interesting application of biscuit. Copeland also exhibits porcelain dinner and tea services; two pink Etruscan vases, jewelled, and an extremely beautiful small jewelled vase; these last articles fetch a high price. We have lingered over the collections of Parian ware with great pleasure, as the introduction of this material is destined to effect for statuary what electrotyping accomplishes in the harder metals; it facilitates the reproduction of the works of the finest artists in a material less costly than marble, with their multiplication to any number of copies, and the elevation of the public taste in articles of fancy.

MISCELLANIES.

TIN MANUFACTURE OF GREAT BRITAIN.

Nearly 900,000 boxes of tin plates are manufactured in South Wales and Staffordshire annually, and almost every article of tin ware is formed from them. Much the largest portion of tin plates exported from Liverpool is sent to the United States. The amount of plates, terne plates, and latten, &c., shipped to different parts of this country, and Quebec and Montreal, last year was as follows:—

	Boxes.		Boxes.
To New-York, . .	378,537	To Quebec, . . .	5,688
Boston, . . .	40,084	South America, .	10,320
New Orleans, .	34,923	Baltimore, . .	2,800
Philadelphia, . .	24,277	Charleston, . .	530
Montreal, . .	15,734		
		Total, . . .	512,400

The following is a statement of the shipment of tin plates from Liverpool to New-York, Boston, and Philadelphia, during the last seven years:—

	Boxes.		Boxes.
1846 . .	195,309	1850 . .	338,538
1847 .	137,440	1851 . .	344,602
1848 . .	297,255	1852 . .	442,898
1849 . .	236,297		

WIRE ROPES, HEMP ROPES, AND CHAINS.

It is an object to the miner to know the best means by which to hoist or transport minerals. The late Frederick Overman, in his work on Mining and Metallurgy, has some excellent remarks upon this point, which we lay before those engaged in mining operations.

"Chains have been used, but they are found unsafe, heavy, and expensive, and are most generally abandoned. The question is now between iron wire rope and hemp rope. In general, one pound of wire rope is equal in strength to one pound of good hemp rope; it is in most cases three times as strong, but there is no necessity of claiming more than pound for pound. One pound of hemp rope will cost from 15 to 20 cents, and one pound of wire rope from 12 to 15 cents; here is, therefore, the advantage in favor of the wire rope. Hemp rope is very unequal in quality; ropes of one and the same size may be, the one twice as strong as the other. This cannot happen in wire ropes; the one quality of wire may be inferior in strength to another, but there cannot be so much fluctuation as is frequently found between hemp ropes. There is another advantage of the wire rope. Hemp ropes are heavy, particularly when working in water and mud; they require more room than a wire rope, and of course the machinery, particularly the drum, must be more capacious. As regards durability, we may state that, generally speaking, a wire rope will outlast six hemp ones, under common circumstances; but there are exceptions, in which the hemp rope outlasts the wire rope. In old coal mines, or mines in which pyrites is decomposed, a large quantity of sulphuric acid is produced, which mingles with the water; this sulphuric acid is generally combined with some solid matter, such as clay, or oxide of iron, and forms with these basic salts. These combinations of the acid do not hinder its corrosive action on iron."

BRAND'S LIQUID FOR STEAM BOILERS.

This is a recent invention for dissolving and preventing incrustations in steam boilers. Its merits have been highly spoken of in Europe, particularly by the head Engineers of the Royal Prussian Artillery workshops, and the Superintendents of the Cologne-Mindens, the Rhenish Railroad Companies, the Cologne-Rhenish Steamboat Company, and many others, which certificates may be

seen at the Agents', Messrs. Bourry & Roeder, in this city. One of these certificates we insert, as containing many particulars respecting the liquid:—

We have used Brand's Liquid since the beginning of summer in all our locomotives.

In the boilers of our stationary engine (cylindric boiler of twenty-four feet length, and three and one-third feet diameter, with two boiling pipes of nineteen feet length, and one and a half feet diameter), we use twelve quarts every four weeks.

The boilers are then blown out with very little pressure, and we find a kind of paste with a foamy cover, which is removed by washing and sweeping. The sides show a very light white coating, and occasional collections of sediment are easily removed. Incrustations never appear again. Formerly the cleaning of a boiler after being the same time in use, required ten to twelve days of very troublesome hammering, scratching and chiselling, by which the boiler's sides were more or less injured, although the incrustation could never be entirely removed.

In locomotives it is a well-known fact, that it is extremely difficult, and in few places only possible, to remove the incrustation mechanically. The use of Brand's Liquid has been entirely successful.

Our locomotives get, according to the service they have to do, and to their size and age, from six to eight, some from eight to ten quarts in four or five days. The incrustation in our old engines is thereby coming out in considerable quantities, and the entire dissolution has in many already taken place. Most obstinate is the incrustation on the side tubes, but there also a very considerable improvement is apparent. In cleansing and repairing the boilers, we find that the removal of defective side tubes—which, owing to the incrustation, was formerly very difficult—has now become comparatively easy.

We have by no means found any injurious effect from the use of Brand's Liquid; neither the metal nor the tightness of the boiler are affected, and no over-boiling of the water, so prejudicial to the power, and to the engines themselves—with which the use of other similar remedies was attended—is occasioned by the use of your liquid.

VON WITTGENSTEIN.

Cologne, Dec. 21, 1851.

RECENT PUBLICATIONS.

Dictionary of Arts, Manufactures and Mines, containing a clear exposition of their principles and practice. By Andrew Ure, M.D., illustrated with sixteen hundred engravings on wood. Fourth edition; corrected and greatly enlarged. 2 vols. 8vo., pp. 1162 and 995. Price $5: New-York, D. Appleton & Co.

This edition of Ure's Dictionary has been brought up to the present time, as nearly as can be done with a work of its magnitude. It is the latest London edition just issued, which has been re-printed in this country. Many of the articles of former editions have been entirely re-written and much new matter has been added, sufficient to make the present one-third larger than any previous edition. It is unquestionably the most complete work of the kind which we possess, and as recent and fresh as it is possible for books to be which treat of any arts in a progressive state.

For the information of those who are not familiar with this extensive and valuable work, we make the following extract from the author's preface, describing its contents:—

I have embodied in this work the results of my long experience as a Professor of Practical Science. Since the year 1805, when I entered at an early age upon the arduous task of conducting the schools of chemistry and manufactures in the Andersonian Institution, up to the present day, I have been assiduously engaged in the study and improvement of most of the chemical and many of the mechanical arts. Consulted professionally by the proprietors of factories, workshops, and mines of various descriptions, both in this country and abroad, concerning derangements in their operations, or defects in their products, I have enjoyed peculiar opportunities of becoming acquainted with their minutest details, and have frequently had the good fortune to rectify what was amiss or to supply what was wanting. Of the stores of information thus acquired, I have availed myself on the present occasion; careful, meanwhile, to neglect no means of knowledge which my extensive intercourse with foreign nations affords.

I therefore humbly hope that this work will prove a valuable contribution to the literature of science, serving—

In the first place to instruct the Manufacturer, Metallurgist, and Tradesman in the principles of their respective processes, so as to render them, in reality, the masters of their business; and to emancipate them from a state of bondage to such as are too commonly governed by a blind prejudice and a vicious routine.

Secondly. To afford Merchants, Brokers, Drysalters, Druggists, and Officers of the Revenue, characteristic descriptions of the commodities which pass through their hands.

Thirdly. By exhibiting some of the finest developments of Chemistry and Physics, to lay open an excellent practical school to students of these kindred sciences.

Fourthly. To teach capitalists who may be desirous of placing their funds in some productive branch of industry, to select judiciously among plausible claimants.

Fifthly. To enable gentlemen of the Law to became well acquainted with the nature of those patent schemes which are so apt to give rise to litigation.

Sixthly. To present to Legislators such a clear exposition of the staple manufactures, as may dissuade them from enacting laws which obstruct industry, or cherish one branch of it to the injury of many others.

And lastly. To give the general reader, intent, chiefly on Intellectual Cultivation, views of many of the noblest achievements of Science in effecting those grand transformations of matter to which Great Britain owes her paramount wealth, rank, and power among the nations of the earth.

The latest statistics of every important object of manufacture is given, from the best, and, usually, from official authority, at the end of each article.

The American Polytechnic Journal, devoted to Science, Mechanic Arts and Agriculture, conducted by Professor Chas. G. Page, J. J. Greenough, M.E., and Chas. L. Fleichmann, C.E., Washington and New-York. Vol. 2, No. 2.

This is one of the valuable scientific journals of the country. Its contents embrace some of the most important topics under the general heads to which it is devoted. In addition to original articles, its pages are enriched by translations from German and other foreign scientific publications. Each number contains the specification, at length, of claims entered at the Patent Office during the previous month, with cuts, illustrative of the particular invention of each patentee. The typography and general appearance of the work are handsomely and tastefully executed, as such a work, so full of useful and valuable information, should be.

THE

MINING MAGAZINE.

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

CONTENTS OF NO. IV., VOL. I.

ARTICLES.

ART.		PAGE
I.	MINING, QUARRYING, AND METALLURGICAL, PROCESSES AND PRODUCTS. By SIR H. T. DE LA BECHE, C. B. F. R. S.	331
II.	THE MINES AND MINERAL RESOURCES OF AMERICA, NO. 4...	347
III.	THE COAL LANDS OF THE DEEP RIVER COMPANY OF NORTH CAROLINA, WITH ANALYSES OF THE MINERALS. By WALTER R. JOHNSON	352
IV.	GOLD AND SILVER PRODUCED BY THE MINES OF AMERICA, FROM 1492 TO 1848, NO. 2	365
V.	MINING PRACTICE IN CORNWALL, ENGLAND	372
VI.	REPORT ON THE WHEATLEY AND BROOKDALE MINES, CHESTER CO., PENN. By PROF. HENRY D. ROGERS	375
VII.	THE BLOW-PIPE, AND ITS USE IN CHEMICAL ANALYSIS	388

JOURNAL OF MINING LAWS AND REGULATIONS.

A Legal Investigation of the Nature of a Mineral Substance 395
Decision of the Supreme Court of California on the Proprietorship of the Mines. 399

COMMERCIAL ASPECT OF THE MINING INTEREST.

Mining Stocks in New-York 401
Fluctuation in Mining Stocks at the N. Y. Exchange Board 402
Mining Stocks in Boston 402
Fluctuations in Mining Stocks at the Boston Exchange Board 405
Importations of Metals, Coals, &c., at New-York 405
Metal Trade of the United Kingdom for July, 1853 405

JOURNAL OF GOLD MINING OPERATIONS.

Gold Coinage in August 406
" " for 1853 406
" " since 1793 407
California Gold Fields 407
Export of Gold from San Francisco for Six Months of 1853 407
Helvetia and Lafayette Co. 408
Gold at Port Orford 408
Permanency of the Australian Gold Fields 409
Mining Progress in Australia 409
Minerals in Australia 411
Gold Mines of North Carolina 412
Separation of Gold from Arsenical Pyrites, according to Plattner's Method 412
London and Virginia Gold Mining Co. 413

JOURNAL OF COPPER MINING OPERATIONS.

PAGE
Coinage of Copper for 1858 412
" " since 1792 412
Lake Superior Copper Mines 413
Albion Mining Co. 413
Mining Operations west of the Ontonagon River 414
Portage Mining Region 415
Bruce Mine 416
Recent English Patent for Improvements in obtaining Copper and other Metals from Ores, or Matters containing them 417
Improvements in Calcining Certain Ores, and in the Construction of Furnaces for that Purpose; and for Converting certain Products arising in the Process into an Article of Commerce, not heretofore produced therefrom 420
Copper Smelting 420

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

Silver Coinage at Philadelphia for 1858 421
" " of the United States 422
Shipments of Lead from the Upper Mines 422
Report on the Great Northern Lead Mine 422
Silver Mines of Chihuahua, Mexico 423
Depositing Alloys of Metals 428
Silvering all Sorts of Metals and Glass 429
Plumbic Zinc. A New Combination 429

COALS AND COLLIERIES.

Anthracite Coal Trade for 1858 430
Cumberland " " " 430
Price of Anthracite Coal 430
Freight of Coal from Nova Scotia 431
Report of the New Creek Coal Co. 431
The Coal Business 433

IRON AND ZINC.

Massachusetts Iron Works 434
Iron Manufactures in Morris Co., New Jersey 435
The Mining and Manufacture of Iron in Great Britain and Pennsylvania 437
Veille Montaigne Zinc Company 439

QUARRIES AND CLAYS.

National Oil Stone 440
Patent issued in May 440

MISCELLANIES.

White Sulphur Springs in Virginia 440

RECENT PUBLICATIONS.

Geological Chart of the United States 444
New-York Tribune 444
American Iron Manufacturers' Journal 444

THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. I.—OCTOBER, 1853.—No. IV.

ART. I.—MINING, QUARRYING, AND METALLURGICAL PROCESSES AND PRODUCTS.* BY SIR H. T. DE LA BECHE, C. B., F. R. S.

As mineral matter, in its first, or natural state, cannot be modified by man, it becomes important that when specimens of it are shown as illustrative of mineral wealth, especial reference should be made to those processes by which such mineral matter is rendered useful. Without this precaution much misconception may arise. Let us, for example, consider the ores of the metals. The mere exhibition of any ore, however rich, is in itself of little value beyond the information that the specimen came from some stated locality. The circumstances connected with its mode of occurrence, and with the means at command to render its extraction useful, are essential. Pieces of rich ores are of frequent occurrence in localities where, from a want of their sufficient abundance, it would be useless to attempt any profitable working of them. Hence collections of ores may often be most fallacious, indeed it is unfortunately somewhat too common to find specimens of ores shown as the ordinary products of mines where they are really rarities, for the purpose of promoting the purchase of shares in such mines. There is a name for such specimens in Cornwall, where they are termed *Slocking stones.* These really come from the mines, but they are unfair representations of their produce.

Again, it often happens, that without the slightest intention of producing erroneous impressions, proprietors or agents, when requested to transmit specimens of their ores, will select, instead of such as show the general quality of those raised, some fine example of their best ores, *a good stone of ore*, as it is often technically termed, while at the same time the mine itself may be returning large profits by the working and dressing of comparatively poor ores, operations of which the agents might be

* From a paper read before the Society of Arts.

justly proud; not the slightest deception is intended, but nevertheless a collection of such specimens becomes extremely fallacious, and conceals and does not exhibit the real industry both required and employed. The teaching influence proposed by collections of ores is defeated alike by both the causes above mentioned. Most important knowledge of its kind is sacrificed, and the public misled by impressions received from gazing on a mass of glittering objects, instead of carefully considering the kind of nineral substances which really produce, by the industry of man, the metals so essential for his welfare and progress.

Looking at the recent London Exhibition as the means to a great end, and not the end itself, its bearing on the future may, probably, be best illustrated by a selection of subjects, which should show deficiencies as well as important exhibitions. The one may be as valuable for progress as the other, if carefully considered and rightly understood.

As fuel is at the base of all the operations the products of which have found a place in the late Exhibition, the power of producing fire being peculiar to man, and one without which his range on the earth's surface would be very limited, and his advance trifling, it may, in the first instance, be desirable to glance at that portion of fuel which is included in Class I.

All our mineral, or, as it has been termed, fossil fuel, is derived from vegetable matter, the growth of various geological times, and of different regions, embedded amid detrital matter of various kinds from local circumstances, and presenting modified aspects in accordance with the general physical and chemical conditions to which it has been subjected. Its chief divisions, for industrial purposes, may be regarded as lignite (the *brown coal* of the Germans) and coal, the latter of various kinds. Indeed the whole constitutes a series, at which woody matter, but slightly altered, is at one end, and stone-coal, or anthracite, is at the other. It may suffice for our present purpose, to mention that the physical and chemical conditions above mentioned are the causes of these differences, and have been of such an order that the proportion of the oxygen and hydrogen of the original vegetable substance became gradually diminished as regards the other two component parts, carbon and nitrogen, so that the carbon greatly predominates, and stone-coal, or anthracite, is the result.

Now, the character of these fossil fuels is of the greatest importance in their varied uses, the products of many operations depending upon it, especially certain metallurgical processes. As this character does not necessarily depend upon geological age—though, as a whole, the older rocks usually contain only that state of fossil fuel known as coal of some kind,—it may be expected to vary materially in different parts of the world. The kind of fossil

fuel found may determine the developement of certain branches of industry, other circumstances being favorable.

That mineral fuel should be much represented in the Exhibition was scarcely to be expected. Its presence, indeed, from lands where it was not generally known to be found, might be advantageous, especially if accompanied by proper information as to its mode of occurrence, and probable abundance and power of extraction. For example, it was important to examine specimens of coal from New Zealand, and learn the thickness and dip of the beds of some of them; and inspect others from Labuan, where the Eastern Archipelago Company are now working a nine-feet bed. The importance of such localities for the supply of fossil fuel, as regards steam-navigation, is evident. Looking, however, at the demand for, and supply of, fossil fuel of various kinds in well-known lands, as for instance, in our own, it may be very much doubted if any mere exhibition of a few specimens, without regard to general views of the manner in which the coals may be variably employed, could be viewed as instructive. There were, however, some good individual illustrations,—as, for example, that of the thick or ten-yard Staffordshire coal,—showing the different working seams, alike interesting to science and coal-mining.

In this and several other cases, where huge masses of coal were sent from some of the British collieries, we have excellent examples of the disinterested aid afforded to the Exhibition. The greater proportion of these exhibitors could look for no return whatever, except the gratification of having assisted a cause which they considered to be good. It was not probable that ten tons of their coals would be altered in their mode of consumption except by new adjustments and demands not depending upon the Exhibition, though the cost they incurred was often heavy, in raising and transmitting their specimens.

As illustrative of the importance of our position as a maritime state, combined with our possession of cheap heat, well situated, the copper smelting of Swansea, with that of Neath, Tai-bach, and Llanelly in its vicinity, may be advantageously adduced. We there find, in addition to the greater portion of the copper raised in the British Islands, cargoes of that ore, and of what is termed the regulus of copper, brought round by the Cape of Good Hope from Australia in one direction, and round Cape Horn from Chili and other South American lands in another. Altogether the copper smelting of South Wales forms an excellent illustration of the advantageous union of geological and geographical conditions, combined with a state of man in a given area fitted to seize and utilize those conditions.

Though regarding the specimens of coal as such, and uncon-

nected with processes to which they were material, the Exhibition might be defective, it contained important illustrations of the mode of occurrence and of extraction of coal. Among the maps, sections, and collections connected with this subject, the exhibition from the coal district of Northumberland and Durham should be cited. It formed an important series of illustrations, comprising maps, sections, specimens of the various coals, the rocks by which they are accompanied, plans of the mode of working the collieries, sections of pits, and the machinery in them, with the safety-lamps used in the district—a highly valuable series, and one formed expressly for the Exhibition. A beautiful model by Mr. Nicholas Wood exhibited the methods of working coal in the northern counties. There were others also in the English department alike instructive, as directing attention to that important subject, the ventilation of collieries, one which has so justly of late attracted public attention. Much good may, no doubt, arise from the appointment of inspectors of collieries in the different districts in this country; but the more effective saving of life from colliery explosions must be looked for in the instruction generally of the coal-miners themselves. The amount of mischief arising from the foolhardiness of ignorance in our collieries can only be credited by those who are compelled to employ men with a want of education they deplore, or who have, in discharge of duties, visited coal-mines after fearful and desolating explosions. Safety-lamps are important in connection with this subject. In addition to those usually employed in this country, there were two from Belgium, where, as well as in France, much attention is paid to the proper ventilation of collieries by the Government authorities.

As relating to the ventilation of collieries, a model of opening and closing the doors in them, by the passage of the horses and wagons, or of the men, without the attendance of boys or others for the purpose, had very important bearings, so many accidents having occurred from the ventilation being disarranged by leaving open such doors. It was a good case of a valuable contrivance, apparently little known beyond the colliery itself—the Foxhole Colliery, near Swansea—being made more extensively so by means of the Exhibition.

As connected in the Exhibition with collieries, though in reality applicable to shafts generally in mines, we should here mention the very important method adopted by Mr. E. Rogers of sinking shafts at Abercarn Colliery, Monmouthshire. By employing electricity in blasting, he is enabled to explode three or more holes, inclined to each other in the depth, simultaneously; and thus lifts a large mass at once from the centre of the sinking, other large masses being in like manner afterwards detached from the surrounding portions towards the sides. By thus calling in

the aid of electricity, and by employing gutta-percha tubes of great size in connection with the pumps, and so avoiding the destruction of the usual arrangements, which frequently take place during blasts while sinking a pit, better work is accomplished, with greater rapidity, and at less cost than by the ordinary methods. The successful application of science and of modern knowledge is deserving of all attention by miners.

That there has been, and unfortunately still is, great waste in our collieries, viewed as a whole, however the working of some districts may exceed that of others (and even those not over remarkable for progress, may yet exhibit valuable exceptions), has been long known, and often pointed out. It was, therefore, an advance in the right direction, when the small coals, sometimes consumed at the pit's mouth, at others thrown back in the workings, were used for, as they have been termed, the *patent fuels.* There are now many of them of different kinds, applicable to different purposes, according to composition. In them the small coal is usually cemented by some bituminous substance, pressure being employed. One kind in the Exhibition was shown by Mr. Azulay, in which great compression alone caused the particles of the coal-dust to cohere. In Warlich's process, specimens of which were also exhibited, after the small coal is made to cohere with some bituminous body by pressure, the resulting bricks are exposed to heat, in order to decompose the bituminous substance, the heat being graduated according to the use to be made of the fuel. This is a highly important point in the patent fuel employed for steam purposes, since, by carefully selecting a proper coal, and heating the brick so as to coke the cementing matter without injury to the coal employed, a very useful product for steam-ships may be obtained.

In the French department, and in a small case, accompanied by a description and explanatory drawing, the whole seldom heeded amid more showy objects, were to be seen some sorted and crushed coals, with a few pieces of coke, having an important bearing upon the employment of cheap and effective heat. It illustrated the method of M. Bérard for separating foreign matter, such as iron pyrites and slate, from coal. Its general principle was that of the "jigging-machine" of the miners, for separating ores, after crushing, from the stony matter with which they may be associated, by agitating the whole in water, so that the various portions become arranged according to their specific gravities. The apparatus, which it would require the needful drawings to explain properly, is remarkably ingenious, and the result certain. In a country like ours, where coal is abundant, such a method might, at first sight, appear little wanted. The Exhibition was not, however, intended for this land alone, but for "all nations;"

so that the application of such a method becomes most important in many numerous small seams, or coals with much iron pyrites, rendering them, in common parlance, "sulphurous," and otherwise valueless, being rendered worth working by its use. Its value is, however, also understood in our country; for, we are informed, works are now erecting for its employment at Newcastle. By using the method of M. Bérard, the Chemin de Fer du Nord, France, was enabled to employ a coal previously found injurious to the locomotives, and a considerable saving was effected. The reduction of ash in the washed coal was very considerable.

Not to dwell longer upon mineral fuel, important as extended views of that subject might be, did time permit, it may now be desirable briefly to consider the ores of the useful metals. The subject of metal mining includes a consideration of the ores, as such; their modes of occurrence in the ground; the methods employed for their extraction; and the means adopted for "*dressing*" them, as it is termed, or of rendering them marketable. The smelter then receives them, and by such metallurgical processes as may be suitable produces the metal.

Respecting the fallacious impressions which the inspection of mere specimens of ores may convey, some remarks have already been offered. No doubt, ores commonly called of the same kind differ, by containing foreign substances, making a material alteration in the labors of the smelter. This is a subject of great importance, requiring all the skill of the metallurgist. Small additions of peculiar substances produce great modifying influences. Many a smelter finds himself at fault as to the causes of certain deteriorations of produce which the scientific metallurgist traces to the ore; and here Science steps in and aids that ordinary practice which might be sufficiently successful so long as the ores of the ordinary composition—those to which the smelter has been accustomed—were operated upon.

Specimens of ores are valuable when selected to illustrate important points of this kind, or when they accompany illustrations of their mode of occurrence, modifications in consequence of that mode of occurrence, or are connected with processes and their results. With the exception of the last, the ores of the Exhibition possessed scarcely any of these conditions; indeed, some were sent from mines which, as previously mentioned, should have been justly proud of their methods of dressing ores of ordinary, and even low quality; yet the specimens transmitted were rich, requiring no refined means of treatment. There were, nevertheless, very rich specimens from some parts of the world, known to represent considerable masses of the same kind; as, for example, the Burra-Burra mines of South Australia have furnished to commerce a large amount of valuable copper ores similar to those

exhibited, and many a mass of malachite from them, which might, as in Russia, have been extensively employed in works of art, has passed beneath the hammer and crushers, and into the furnace. Small as the metal exhibition of Sweden may have been, the ores sent were good examples of those whence the fine iron of that land is obtained. In like manner, there was no reason to doubt that the rich iron ores of the United States and of Canada did fairly represent masses of the like ores in those countries; and so also with ores from some other lands. Looking, however, at those shown generally, the previous remarks were needed.

One of the most important series of ores in the Exhibition, viewed with reference to its object, and, coupled with the information with which it was accompanied, as illustrating a particular mineral produce in a given country, was that of the iron ores of Great Britain, collected and sent by Mr. Samuel Blackwell. It was formed at both much trouble and cost by its exhibitor, and for no other purpose than to render good service to the Great Exhibition, in the first place, and to the stores of the Museum of Practical Geology, to which it was presented for national use, in the second.

The ores in this collection are of two kinds; the one, known as clay ironstone—an indifferent name—is fundamentally a carbonate of iron, mingled variably with the matter of the ancient mud and silt, among which it was originally deposited, and from which it has, under geological conditions, been separated into continous beds or ranges of nodules. The amount of metal in the ore depends upon that of the carbonate of iron in it. In the ordinary carbonates of iron (which are still not quite pure), known as spathose iron, and of which there were specimens from Austria, the Zollverein, and other places, there is usually from fifty to sixty per cent. of protoxide of iron. In the clay ironstones the metallic iron ranges sometimes up to forty per cent. The clay ironstones are most important to Great Britain, the greater part being found associated with the coal-beds in our coal measures, and so that they are worked with, or near to each other. From these ores more than 2,000,000 tons of iron are now made in this country. Besides those in the Blackwell Collection, numerous specimens of these ores were to be found attached to illustrations of the products of different iron-works.

The other iron ores in the Blackwell Collection were varieties of the oxides, chiefly hæmatites, the quantity of metallic iron in which, when the ore is good, is from sixty to seventy per cent. The amount of hæmatite ores worked in this country, though they are abundant, is not comparatively considerable. It is, however, smelted alone, and there were illustrations of this in the Exhibition; and it is, also, mixed with the clay ironstones in many furnaces.

Respecting the mode of occurrence of ores—a most important point—the Exhibition did not furnish many illustrations. As regards specimens of that character, it was not to be expected that they could be readily sent. Such collections are the work of time; requiring, moreover, a constant attention to given objects of inquiry in connection with the general subject, as is abundantly proved by the difficulty experienced by all mining schools in satisfying these requirements. We have a fine illustrative collection of this kind at the Museum in Jermyn Street, but it took us sixteen years, with all our opportunities, and the hearty co-operation of able men in the mining districts, to obtain it. It is by no means easy to find proper illustrations, in sufficiently moderate volume for exhibition, of some of the chief facts observable in a mineral vein, or lode, often only to be seen on the great scale.

With respect to the mode of occurrence of the metalliferous ores, it may, in all its generality, be regarded as two-fold, in beds or layers, or filling cracks, fissures, and other cavities. The clay ironstones, and certain oxides, known as bog-iron ore, belong to the former division. The alluvial, or other detrital beds, in which gold is found, as in California, Australia, Russia, and many other lands, may be considered as also included in it. So, likewise, such deposits as the cupriferous slates of Mansfeld, of which there were specimens in the Zollverein department. The sections on the wall, horizontal and vertical, will show the mode of occurrence of the clay ironstones with the associated coal-beds in Merthyr Tydvil, the chief locality for iron-works in South Wales. In such districts some beds of iron stone (and in the sections before you many are shown bearing various names) often present constant characters for considerable distances, while others are more variable in composition and thickness.

Looking at the auriferous beds in some regions, even those from which much gold may, as a whole, be obtained, we must often regard the mode of occurrence of the metal as, taken with the bed, to represent a poor ore. When, as in some of the Russian gold washings, two hundred tons of the detrital mass have to be washed and examined, to obtain a single pound weight of gold, it can be viewed as little else.

The best illustration to be found in the Exhibition of the mode of occurrence of the clay ironstones and associated coal, was that afforded by the beautiful model accompanying the Ebbw Vale collections: the sequence in which, from the coals, ironstone, and limestone used, through the models of the furnaces to the various products, was highly instructive and creditable to the Company exhibiting them. The model was formed of an original part made by Mr. Thomas Sopwith (so well known for his skill in that de-

partment as well as in others), to which the Company had added a continuation. The model is constructed to a common scale for height and distance, the surface represented to correspond with the actual ground, with the rivers, roads, fields, and buildings, while the lower part exhibits—every coal and ironstone bed being shown—the true relative positions of the various beds, with the works which have been carried on upon them. Considering how completely these models may be made to record all the workings, and how far superior they are to the usual plans and sections, it appears surprising that they should not be more used than they are, affording as they do, such clear and accurate information to all interested.

As to illustrations of the mode of occurrence of ores in mineral veins or lodes, the most instructive and important were specimens of part of the silver lode of Kongsberg, Norway; and of part of the lead lode of Grassington, Yorkshire, sent by the Duke of Devonshire. A few large lead specimens in the English department exhibited points of interest; and these, with some specimens in the South Australian copper series, certain of the iron and zinc series in the American collection, a few specimens from Canada, a few mining sections from Cornwall, and those accompanying the exhibition of the lead series of Allenheads, Northumberland, may be said to complete the illustrations of this kind. The means of extracting ores from the metalliferous mines were but slightly represented. There were illustrations of safety fuzes for blasting, some methods of raising and lowering the miners and for raising the ores, and a few Cornish mining sections. With reference to this subject, however, a large and beautiful model of water-wheels, connected with pumps from the Devon Great Consols Coppermines, requires especial mention. The dressing of ores did not receive overmuch illustration. There was a good model representing the methods of dressing the inferior copper ores of Tywarnhale mines, Cornwall; and it may be deserving of remark that, although the produce of Cornish and Devonian ores does not exceed an average of about eight per cent. of the metal after the ores are dressed, the mines of that district have been estimated as furnishing one-third of the copper raised throughout other parts of Europe and the British Islands. The Truro committee sent good illustrations of preparing tin ore for the smelter, and there were also some other illustrations of dressing tin ore. The lead-dressing of the Allenheads mines, Northumberland, was well shown; and the Kongsberg (Norway) series exhibited the dressing of the silver ores of those mines in a detailed manner.

With respect to the metallurgical processes and the metals produced, the case was different, more especially as regards iron. This metal, the most important to mankind, formed the chief

feature in Class I., whether in the British or foreign departments. There were some excellent illustrations from different British iron-works, including the ores and fuel employed. The various kinds of iron were well exhibited. The Ebbw Vale exhibition contained a model showing the method adopted at those works for utilizing the gases evolved from the surface. The proprietors of the Low Moor and Bowling Iron-works did not forget their old reputation for iron, and exhibited some remarkable specimens. As a general illustration of British iron, that of Mr. Bird may be cited. Some remarkable pieces were to be there found from the various works and districts. Among them was probably the largest bar of iron ever rolled, being seven inches in diameter and twenty feet one inch long: this was made by Messrs. Bagnall, of West Bromwich, and weighed nearly one ton and three-quarters. There were some fine examples in this collection of large drawn tubes, and others illustrating the qualities of the various irons. Canada and Nova Scotia exhibited their iron: some bar-iron of good quality from the former was remarkable for being manufactured from bog-iron ore, not usually found good for bar-iron.

The Austrian series of iron was excellently well displayed, and very illustrative. Many parts of the series showed the ores whence the metal had been obtained, with the various parts of the processes, including the slags. In this collection was a most remarkable example of the fine rolling of iron, the latter itself being necessarily of excellent quality. The "iron paper," as it is termed, from Neudeck, in Bohemia, was superior to all of its kind in the Exhibition. It may not be out of place here to cite this Bohemian "iron-paper," in illustration of some of the useful effects of the Great Exhibition. It soon attracted the attention of those skilled in iron, as such thin rolled iron is important for button-making. A spirited party, connected with the iron trade at once proposed, in a proper quarter, to imitate this Bohemian product. This was attempted, and though the result was not quite equal to the original, before the Great Exhibition closed, thin rolled iron of a quality not heretofore produced in this country was to be had in the market.

There were good illustrations also, of the Belgian iron, as employed for various purposes. Though Russia did not put forth her strength in fine iron, there were, nevertheless, some excellent examples of it, both from her imperial and private works. Some specimens of sheet-iron were remarkable for their quality. Sweden was deficient in that iron for the quality of which she is so celebrated; and France, though raising a large quantity of iron, was scarcely represented in that metal. There was but little iron in the Zollverein department. The Siegen iron, produced from the carbonate and hydrated oxide, was not, however, neglect-

ed; and the illustrations of iron from Nassau were effective, as were, indeed, those of the general mineral produce of that state. Spain sent some of her iron, and the United States forwarded some good illustrations of theirs.

With regard to copper, the chief illustration of its smelting, as practised in this country, came, as might be expected, from Swansea, where, as has been already stated, so much of the copper ore, not only of the British Islands, but of other parts of the world, is converted into metal. The series sent was important. The Messrs. Bankart exhibited illustrations of their patent process of reducing copper ores. Though referred to Class II., mention should be here made of Mr. Longmaid's process of reducing copper ores. In it the sulphuret of iron and copper, known as copper pyrites, is roasted with chloride of sodium (common salt). Sulphate of soda is produced, the copper is converted into a soluble sulphate, the iron left, and the chlorine liberated. The copper is then thrown down from its solution. There was also copper from the smelting works, Bruce mines, Lake Huron, Canada; and the Burra-Burra copper ores were accompanied by copper smelted at their works, recently established at those mines. In the Zollverein department were to be found illustrations of the processes followed in extracting the copper from the cupriferous state of Mansfeld, and those also showing the manner of obtaining the silver from the same beds. Rolled copper was exhibited in the Russian department; a few pieces of copper were sent by Austria, and others from the Roraas Works, Norway; a cake of copper, with the ores from which it was obtained, was sent from the mines at Montecatini, Tuscany; copper, accompanied by specimens illustrating the method of its smelting, was exhibited from Rio Tinto, Spain, as also some fine copper from Seville. Regarded as a whole, the copper exhibition was defective.

As to lead, the illustrations were chiefly British. There was an excellent exhibition of Pattinson's important process for desilverizing that metal—a process which has been of such service to lead-mining generally, rendering many lead-mines workable with profit which must otherwise have been abandoned. The chief ore whence lead is extracted is that known as galena, or the sulphuret of lead, furnishing from seventy-five to eighty-three parts of the metal, according to purity. It usually, though not always, contains silver in variable proportions. Upon the quantity of silver often depends the profitable raising of the ore. Previous to the invention of Mr. Pattinson (of Newcastle-upon-Tyne), about twenty ounces of silver in the ton of lead were required to render the extracting of the metal worth the cost, since then as little as three and four ounces in the ton of lead will repay extraction. Now, as so many ores contain small quantities only of sil-

ver, the importance of the process is evident. In a scientific point of view it is one of much interest, as it consists in so conducting the work that portions of the lead can crystallize, by which the silver becomes excluded, in the manner in which, in many crystallizing processes, foreign substances are excluded during crystallization. Thus, by degrees, a mass of mixed lead and silver is left, extremely rich in the latter. When this richness in silver arrives at the point desired, that metal is extracted, in the usual manner, by cupellation. The lead-smelting at the Allenheads mines, and at the Wanlock Lead Hills, Dumfriesshire, both excellently displayed, are both founded on Pattinson's process. While touching on the Wanlock Lead Hills exhibition, we should not pass over the arrangements by which the fumes from the furnace are prevented from escape, and from damage to the surrounding country, while lead, to the amount of thirty-three per cent. from the deposits, or "fume," is obtained.

The Grasshill mine, Teesdale, transmitted illustrations of its lead-smelting, accompanied by sheet-lead and lead-pipes. The Snailbeach lead mine, Shropshire, also sent sheets and pipes. From Cornwall, also, and from Ireland, there were examples of lead products. There was also some lead from Bleyberg and Vedrin, Belgium; from Spain; from Tuscany, and the Zollverein. The foreign examples of this metal were, however, inconsiderable, viewed as a whole, the chief part of the lead exhibition being British. As illustrating both the good quality of the metal, as a proper method of drawing it, we should not pass over the stall of M. Poulet, in the French department, containing lead wires and tape, or spun lead, as it was termed.

With regard to zinc, the chief exhibition was that of the Vieille Montagne, Belgium, dispersed in the Belgian, French, and English departments. This establishment is the most considerable of its kind in the world. The illustrations of its produce, sent by the Company to whom it belongs, were alike remarkable for their abundance, variety, and importance. The establishment now employs 2646 persons, and it produced 11,500 tons of zinc in 1850. With the exception of some ingots of zinc from the Eschweiler foundries, Stolberg (Zollverein department), and others from the Sterling Hill Mine, New Jersey, there would appear to have been no other illustrations of zinc smelting and drawing.

As respects tin, a very important process for separating wolfram (tungstate of iron) from tin ore, was sent by Mr. Oxland, the inventor, from the Drake Walls Tin Mine, on the Cornish side of the Tamar. It may be termed a mixed process of dressing and smelting. Much difficulty arises in the dressing of tin ore when wolfram is present, as too often is the case in Cornwall and

Devon, the specific gravity of the two being so nearly alike, that of tin ore (peroxide of tin) being 7, and of wolfram, 7·1. After crushing, or otherwise pounding, the mixed substances, they are roasted, and the wolfram still remaining unaffected, after again washing they are roasted with carbonate or sulphate of soda, and the process so conducted that the tungstic acid leaves the iron and combines with the soda, thus decomposing the wolfram, and tungstate of soda being formed, the tin ore (commonly termed *black tin*) is then fitted for further treatment in the smelting-house. The ordinary method of smelting tin in Cornwall was shown by a model (sent by Mr. Bolitho, Penzance) of the reverberatory furnace employed, accompanied by specimens of the various ores as prepared for smelting, and of the products of that process. The tin of Cornwall and Devon has long supplied the chief portion of that consumed in Europe and on the shores of the Mediterranean. In 1850, 10,052 tons of the ore were raised. Taking the ore at 50*l*. per ton, it would have a value of 500,000*l*. in that State in 1850. Tin is now imported from other lands. In 1850, 1798 tons of tin, chiefly from Banca, were imported; and 2211 tons were exported; showing that only 413 tons of British tin found its way elsewhere, the chief part of our tin produce being reserved for our own industry, for which it is in many ways so important. Tin was shown from the Malay peninsula; from Schlaggenwald, Bohemia, and from the Avian mountains, Spain.

Respecting silver, Pattinson's important process has been already mentioned. Attached to its illustrations was a large mass of silver weighing 3000 ounces, well showing the "spitting," as it has been termed, which takes place while the mass was cooling. In the Allenheads series there was a cake of silver prepared by the same method, weighing 8000 ounces. The Kongsberg collection was completed by proper illustration of the silver itself.—There was also smelted silver from Prince's Location, Lake Superior, Canada; from the Almeria mines, Spain; and from Eschweiler mines, Stolberg (Zollverein).

As to gold, there were examples of it from Canada, India, the United States, and West Africa. There was also a remarkable specimen of gold from Chili.

The most important exhibition connected with gold was that from Reichenstein, in Silesia. It afforded an excellent example of an application of science by which ores previously profitless became valuable; indeed, the mines had been abandoned for five centuries on account of their poverty, though known to be auriferous. It is not the precious character of a metal in a mine that renders it important, but its relative amount, making the difference between profit and loss in obtaining it. The Reichenstein case is one where the progress of science rendered a working pro-

fitable not previously so. The process adopted was that of Professor Plattner, of Freiberg. The ores of the Reichenstein mines are arsenical pyrites, containing about 200 grains of gold in the ton. These are roasted in a reverberatory furnace, surmounted by a large condensing chamber, on which the arsenic is deposited, as it rises in fumes. Oxide of iron, a certain quantity of arsenic, and the gold in the ore, remain beneath. These are placed in a vessel, so that a current of chlorine gas is transmitted through them. The gold and iron are attacked, are separated from the residue by solution in water, and the gold is precipitated by sulphuretted hydrogen. The importance of the process is evident; and it is but justice to Dr. Percy to state, that at the meeting of the British Association at Swansea in 1848, he advocated the employment of chlorine for a similar purpose.

With respect to the metals platinum, palladium, iridium, and rhodium, they were shown in their different metallurgic states by Messrs. Johnson and Matthey; and the method of reducing antimony was well illustrated by Mr. Hallett.

We have entered into some detail on the subject of the metals, in their various states, from the ore in the mine to the metals themselves, not only from the importance of the subject, but also in order to show the character of the Exhibition as regards this portion of it. It will have been observed, that no mention has been made of some important metalliferous countries, and that, even as regards others, metallic products for which they have been known have not been noticed as coming from them. Those old cradles of European mining, Saxony and the Hartz, did not transmit any of their products, nor any illustrations of their mining operations; neither were the mining regions of Mexico and the South American States represented, except indeed by a remarkable specimen of silver, and another of gold from Chili. As a general fact, and one well known to all who had to investigate the subject, though here and there important exhibitions were to be found, mining generally, even that of our own country, required far more illustration than it received. Let us not, however, be surprised at this; the marvel was, fairly regarding the conditions under which the collections were made, that so much had been accomplished, not so little. In no department of the Exhibition will have been found more perfect disinterestedness on the part of the exhibitors. The honest miner, not forwarding specimens of ores for the purpose of exciting attention to shares in his mines could gain nothing by sending illustrations of his ores and methods of preparing them, and yet the cost of transmitting such heavy articles was considerable. The collector and describer of the important series of British Iron ores will not dispose of a ton more of his iron for all the trouble and expense which that collec-

tion has occasioned him. The same with numerous others. All these were thorough good-will offerings to a cause considered good, and, as such, are deserving of all public acknowledgment.

The class under consideration also included steels and the alloys generally of the metals considered as raw materials. The first was an especial difficult subject to treat without reference to other classes where that metallic substance was employed, seeing that the various kinds of steel had to be made for the work for which they were intended. As for example, in the Sheffield department, raw steel was shown, with one exception, in connection with the various manufactures it contained. Fitting steel was to be found with the files, the springs, or cutlery, as the case required. As steel is usually made, in this country, from Swedish and Russian iron, the steel of Mr. Solly, of Leabrook, made with British iron, and exhibited, should be mentioned.

As a steel exhibition alone the most illustrative collection was that sent by Messrs. Naylor, Vickers and Co. It was accompanied by a large and beautiful model of the furnaces, rolling-mills, and forge, and was, altogether, a most effective display of British steel. In the Zollverein department there was a remarkable exhibition of steel by M. Krupp, of Essen, Dusseldorf; but here again it was difficult to separate a consideration of the raw material from the rolling-mills and other objects to which it was applicable. A broken cylinder of this steel, measuring fifteen inches in diameter, was particularly remarkable. There were illustrations of steels from various lands, and they, with the irons, may be regarded as the most effective part of the metallic collections in the Exhibition.

With regard to brass, there was little that came within Class I., but the most important considered in it was the series exhibited by the MM. Estivant, of Given, France. It was an excellent collection, composed of articles of ordinary manufacture at their establishment, often of great size and difficulty of execution. Though employing the usual mixtures of copper and zinc, it is stated that especial measures are adopted by which the fine products shown are constantly obtained. There were rolled bars and tables of considerable dimensions, as well as excellent laminated brass of extreme thinness.

In the English series some alloys of iron with different metals were shown by Mr. Stirling. Articles made with them were also exhibited, and these alloys were stated to have some remarkable properties. There were varieties of other alloys in the Exhibition, many of considerable importance; but these were usually so combined in manufactures as not to come under Class I. There was, however, a case containing 176 specimens of the useful metals and their alloys, shown by Mr. Jordan, of Manchester, which

should not be passed over without adverting to its very useful character.

Plumbago, or black-lead, as it is so erroneously termed, should, perhaps, have been noticed after the coals, seeing that it is a substance chiefly composed of carbon with some admixtures of other substances, not unfrequently iron. The importance of plumbago for the arts and for crucibles is well known. After the Borrowdale mines, Cumberland, were somewhat exhausted, it became important, for that variety of plumbago employed in arts, to obtain some substitute; and varieties of compounds were invented, but nothing succeeded so well as the compressing process patented by Mr. Brockedon, of which illustrations were in the Exhibition. By this process much of the Borrowdale plumbago dust has been utilized with advantage. It, or any other good plumbago, is ground into fine powder, placed in packets, and then receives a pressure equal to about 5000 tons. To prevent the injurious effect of disseminated air in the packets of fine powder, it is extracted by means of an air-pump, and thus the particles themselves can be brought into close juxtaposition and forced to cohere. Of the application of plumbago crucibles there were several examples, some well known for their quality.

Of building stones it could not be expected that there would be many not British. There were, however, a few specimens in other divisions. The most important series was that of Messrs. Freeman of Westminster, where the various stones employed in London for architecture and engineering found their places. Dispersed illustrations of similar stones were also to be seen in other departments.

With respect to marbles, serpentines, porphyries, and granites, it is needful to refer to other classes for a proper appreciation of those exhibited, many being only to be found in a worked state. Taken as a whole, they were fairly represented. The British was an effective exhibition, more especially when regarded with reference to the mode of work employed. Marbles were sent from France, Belgium, Spain, Portugal, Italy, Greece, the German States, India, and even from South Africa. In foreign porphyries and granites there was no great display. The porphyry and granite of Sweden were, however, not forgotten; neither were the granites of the Vosges, France, and certain granites and porphyries of Portugal, unrepresented.

Respecting slates, for the production of which this country is so remarkable, there were good illustrations, especially when regarded with reference to their manufactured state. There were also examples of slates from Canada. Foreign slates were little exhibited; the well-known Angers slates, France, were only represented by a few of the smaller size. There were, also, examples of slates from the United States, Sardinia, and Nassau.

Mr. Meinig, of Leadenhall Street, sent a splendid display of polishing, sharpening, and grind-stones, from all parts of the world—a most remarkable exhibition of its kind. Similar mineral products were to be found dispersed through various departments. Our own grind-stones were not forgotten; and the well-known millstones of France and Belgium were well represented.

Of porcelain or china clay, the chief exhibition was that from Cornwall and Devon, which, with the addition of Cornish felspar, used in porcelain, was effective. There were some examples of porcelain clay from France; and in the Chinese collection, among the various materials employed in the manufacture of porcelain, were some illustrative specimens of similar clays. Many examples of pipe and other clays were to be found, as well as excellent illustrations of British fire clays and bricks.

The important subject of mineral manures was not forgotten. The various substances, bones, teeth, coprolites, and concretions of phosphate of lime, from the tertiary series of Felixstow, near Ipswich, were shown, as were also the various bodies containing phosphate of lime from the British cretaceous series of some localities. There was likewise an illustrative collection, pointing to the importance of mineral manures, in the French department.

Of the mode of occurrence of gems there were some valuable illustrations, such as of the emeralds of New Grenada and the turquoises of Arabia. If it may be permitted to include the precious stones generally (and a very fine collection of cut gems was shown in the Class I., British department), looking at the exhibition of them as a whole, it may be probably regarded as the most remarkable ever assembled in a single building.

Art. II.—THE MINES AND MINERAL RESOURCES OF AMERICA. No. IV.

To W. J. Tenney, *Editor of the Mining Magazine.*

You will excuse me for noticing a little matter to which a friend has called my attention, and which you may esteem frivolous. I allude to an Editorial notice of "The Mining Magazine," in "The American Journal of Science and Arts." Had it been any other publication, I should have allowed it to pass unnoticed, and should even as it is, had there not been an apparent illiberal disposition on the part of the Editor to "take down" the whole work, for what may have been a fault in the compositor, or neglect on my part in not reading the proof, or ignorance of the subject under consideration, or all combined.

The reason given by that Journal to show that the Mining

Magazine is not just what the public requires is, that the second article on "The Mines and Mineral Resources of America" was not compiled with sufficient care. The Editor then states that in mentioning the mineral productions of New-York, "distinction is seldom made between the good and bad localities." It is not to be expected that an humble individual like myself should find time to write lengthy reports, and serve the public with stereotyped editions. That honor seems to be claimed by "The American Journal of Science," and six times every year the less favored portion of mankind imbibe so much knowledge as it is pleased to impart, and no more.

In referring to the artificial oxide of zinc, the Editor says it is correctly described in his Journal by Doctor Torrey, as early as 1822, and more recently, in 1853, by Mr. Blake. I admit that 1853 is more recent than 1822, but if Dr. Torrey described it correctly, why did Mr. Blake describe it at all. Did he suppose the scientific world had entirely forgotten what Doctor Torrey had said upon the subject? I leave the reflecting public to answer.

Will the Editor be so kind as to inform himself by referring to the 5th vol. Silliman's Journal, pages 235 and 339, for cadmia ancramitic, or oxide of zinc? So far as a notice of it is concerned, the statement of the Journal seems to me to be frivolous, and to be done with a view to bring to the notice of the world, the fact, that Mr. Blake did actually discover in the Journal of Science, that Doctor Torrey correctly named the artificial oxide of zinc as early as 1822, and that Mr. Blake has actually reiterated the fact, and the Journal has published it.

The Editor then states that certain zinc ores found in New-York, are stated to yield *sulphate of zinc*. This should have read sulphuret of zinc, and is a typographical error which might befall any new enterprise, unless it had seven Editors. Chromate of zinc may, or may not, be improperly stated. It is a chromate of iron in combination with carbonate of zinc, whether mechanically or chemically mixed, I have not had time to examine.

In conclusion, the learned Editor says:—"Article No. 2 on The Mines and Mineral Resources of America thus leads the reader to believe that many things occur in the State of New-York that do not, and that many localities afford workable beds, where there are mere traces of ore." I find in an early number of The Mineralogical Journal, a report of Professor Silliman on the mines of Southampton. In a note to the Editor, he apologizes for a want of time and proper care in preparing the article for the press. Now, if a gentleman whose pursuits are purely scientific, standing close at the head of one of our most flourishing institutions of learning, which has afforded an ample support to its Professors, finds it necessary to apologize for want of time,

how ample is the ground of excuse for one whose knowledge has been acquired in the extreme straits of fortune, laboring under every disadvantage, and when the article referred to, was written in the midst of the arduous duties of a daily business.

But I have other and further claims upon the forbearance of the readers of the Mining Magazine. When I commenced writing these articles, it was distinctly stated by me that I assumed the task only, because there was no one who seemed disposed to write upon the Mines and Mineral Resources of America. Now if there is any gentleman who will assume my position, I should be pleased to surrender it at once, and will do so, if satisfied that he is competent to fill my place.

The public has looked for something of this kind from our learned Professors, the prestige of whose names would have given eclat to the work, and the public would have responded by the necessary pecuniary sacrifice.

In fact the sciences of Geology and Chemistry, as applicable to the development of the Mineral Resources of America, have been quite overlooked by our learned men up to the present time. No hints have been given, or plans devised, whereby any of our mines have been made to pay expenses. Coal and Iron, from natural causes, have, in the hands of "young America," been made productive, and in defiance of the obstacles thrown in the way by Professors who had no practical knowledge of what they were attempting to do. Beyond this point, until quite recently, we have made no progress. The lead furnaces in the west were as rude as the men who dug out the ore, and in perfect keeping with their system of mining. Copper has been known for many years to exist in inexhaustible quantities at Lake Superior, and in Tennessee, North and South Carolina and Georgia. "Old America" has from time to time reported upon it, and induced the investment of small sums of money; just enough to insure its loss, and thereby permanently prejudiced the development of the Resources of America. But leaving for the present this subject, I shall proceed to give you a hasty sketch of the Mines and Mineral Resources of the State of Pennsylvania.

As the coal of Pennsylvania is at this moment the most valuable and important mineral in the United States, a brief but imperfect notice may not be uninteresting here; but those who desire specific information can find it at any of the large book-stores in Philadelphia, and I presume in New-York. The coals of Pennsylvania are of three kinds,—Anthracite, Semi-Bituminous, and Bituminous. Anthracite coal is found on the northeastern branch of the Susquehanna, extending east more than thirty miles; also near the head waters of the

Lackawanna, Muncy, Lehigh, and Schuylkill rivers. It also extends down the Susquehanna about ten miles below Sunbury, and down the Schuylkill, terminating about twenty miles above Reading. For particulars, see geological maps of the coal-fields of Pennsylvania.

Coal is also found on the west side of the Susquehanna, extending from near the mouth of the Juniata river, through all the country watered by the west branch of the Susquehanna and its branches to Pittsburgh, thence down the Ohio river and its tributaries, covering probably from one-fourth to one-third of the State. The importance of this immense coal formation is, even at this day, not fully comprehended. It was to her coal-fields, more than any other cause, that England is indebted for the high national position she occupies. Ths coals of England have enabled her to bring into daily exercise the physical power of one hundred millions of men, and hence her continued prosperity; for all wealth is the result of labor, whether performed by the hands of men, by the steam engine, or any other power. This labor is the great modifying element of commerce, and of the political and social condition of the world.

The iron mines of the State are second in importance only to the coal-fields. This ore is found abundant in almost every county in the State.

Argillaceous oxide of iron is found abundantly in Armstrong county. The magnetic oxide occurs at Chestnut Hill, and also the foliated oxide and chromate of iron. The oxide is also found abundantly in Chester county, and chromate in Delaware county. At Easton, magnetic oxide of iron occurs, and the micaceous oxide of do., scaly red, do. do., compact do. do. do., ochery red oxide of do.; hematite brown oxide, compact fibrous, also argillaceous oxide of iron all exist in the same geological range, and also iron sand. At a place called Chestnut Hills, in the immediate vicinity of Easton, is found the following ores: micaceous oxide of iron, red oxide of iron, argillaceous oxide of iron, and chromate of iron. At Edge Hill, magnetic oxide of iron, argillaceous oxide, and brown oxide occur; and also at Jenkinstown, Mercersburgh, Sunbury, and in Northumberland; chromate of iron is found about twelve miles from Philadelphia, on the Westchester and Lancaster road, accompanied with magnetic and brown hematite iron ore, and in many other locations in nearly every section of the State. I have noticed a very pure iron ore in the town of Fulton, and apparently in immense quantities.

Lead Mines.—Lead ore occurs in quantities in several places in the State, some of which are worked to considerable extent, and are very productive. The Chester county mines are the most extensive. The ore is a phosphuret of lead, containing a fair pro-

portion of silver. There can be but little doubt these mines will be remunerative. Sulphuret of lead also occurs in Bald Eagle Valley; the sulphuret and carbonate of lead occur on Canastoga creek, near Lancaster. It is found also at Northumberland, Sunbury, Perkiomen, and near the Maryland line in the town of Fulton.

Copper Ores.—This ore occurs in many places along the Blue Ridge, in the form of green carbonate, red oxide, and metallic copper; and also at Chester, in the form of sulphuret, and in the towns of York, Hewlin, and Westchester. Native copper has been found at Hamilton Ban, and the gray and yellow sulphuret of copper at the Water Gap mines. Red oxide, and green carbonate of copper ore is found in quantities in Lancaster county, in the town of Lancaster. Native copper has been found at Morgantown; it also exists at the Perkiomen mines as native copper; pyritous red oxide, and blue carbonate of copper, earthy blue carbonate, fibrous malachite, and compact malachite of copper occur. Native copper is also found at Potts Grove, also at the Gap of the Blue Ridge, and in Fulton or Washington, and several other places of less note.

Zinc Ores.—Sulphuret of zinc occurs in Bald Eagle Valley, at the foot of the Blue Ridge, and the silicious carbonate of zinc on the Canastoga creek, nine miles from Lancaster; sulphuret of zinc, or yellow blend, near Sunbury; calamine is found on Perkiomen creek, twenty-three miles from Philadelphia; also, sulphuret and silicious carbonate of zinc. At Friedensville, near Bethlehem, Pennsylvania, carbonate of zinc of a silicious character is found in great abundance. Zinc is also found in greater or less quantities in all or nearly all of the iron mines in the vicinity of Reading. In many instances it is so abundant as to be prejudicial.

Manganese occurs at Broad Mountain, and on the east branch of the Susquehanna river, where it enters the State. Sulphuret of barytes is found abundantly at the foot of the Blue Ridge, in Bald Eagle Valley. Graphite is also found in Bucks county, and in Bustletoun.

Marbles.—Black marble occurs at Aaronsburgh; breccia marbles are found abundant at McKessangburg hand Hamilton Ban; veined marbles exist about four miles northwest from Easton; at Sandersburgh marble also occurs.

Buhrstone is found at Allentown, and used for millstones. Kaolin, clay, and sand are found abundant in nearly every portion of the State, and limestone, suitable for agricultural purposes and marl. Phosphate of lime occurs near London Grove; and what I named in the 2d number of the *Mining Magazine* as "chromate of zinc," in the town of Fulton.

TO BE CONTINUED.

Art. III.—THE COAL LANDS OF THE DEEP RIVER COMPANY IN NORTH CAROLINA, WITH ANALYSES OF THE MINERALS.—By Walter R. Johnson.

Gentlemen:

Agreeably to your request, I have examined the coal and ore lands belonging to your company, lying on Deep river, in Chatham and Moore counties, in North Carolina. I have also, in accordance with your wishes, extended my observations along the range of the formation in which your mines exist, with a view to ascertain whether the usual regularity observed in other coal districts, would be found there; or whether, as has been confidently predicted by persons supposed to have some acquaintance with coal formations, it would be found a mere chance seam, or *seamlet*, of carbonaceous matter, mostly composed of shale, passing here and there into coal, but wholly destitute of economic value. Such an inquiry was obviously one of high importance, since a mere local deposit, extending but a few acres, would not possess interest enough to warrant large outlays in means and appliances for mining, and especially for transportation to distant markets.

As this coal-field is situated in a region of country, where, for the most part, timber is abundant, and wood for fuel may be had for little more than the trouble of collecting it, the use of coal to supply the wants of the neighborhood would be of little consequence. It is proposed to offer some remarks on *the situation of the mining district*, the geological and mineral character of the formation; the situation of the coal in respect to water level, the position of the seams and their inclinations, their thickness, the character of the coal found at different points; particular character of the coals found on the property of your company and its immediate vicinity; the cost of mining and delivering it on board of barges; the means of conveying it to market at the seaboard; and finally, on the advantages of the position of your property in respect to climate, health, and means of subsistence for a mining population.

GEOLOGICAL CHARACTER OF THE FORMATION IN WHICH THE COAL OCCURS.

It appears from all that I have hitherto been able to learn, that the North Carolina coal formation is an independent one, being detached from that of Southeastern Virginia, as well as from all the great coal districts of the West. It is wholly embraced within the long belt of sandstone formation which near-

crosses the State of North Carolina from northeast to southwest, through its geographical centre.

But though not united to the coal field in the vicinity of Richmond and Petersburg, it will be found that in prolonging towards the northeast the axis of the *sandstone and coal formation*, the line of direction passes not far from the city of Richmond. The coal has, in both fields, been overspread with drift; in both, the coals when unaltered, are similar in composition; in both, the intrusion of trap dykes is observed; and in both, I *think*, that the same classes of fossils occur, but of this further confirmation is required.

At page 12 of his first geological report, rendered in 1824, Prof. Dennison Olmsted traces with considerable minuteness of detail, the boundaries and extent of the sandstone formation, in which the coal field of Deep river is included. His language is as follows:

"The sandstone extends from Oxford in a southerly direction quite through the State. Its length within our own State is about 120 miles. The breadth of the formation varies considerably in different places. On the southeast of Oxford it disappears among the valleys converging almost to a point; on the Neuse its breadth is about 12 miles; between Raleigh and Chapel Hill it is about 18 miles; not more than eight miles on the Cape Fear, but southward of that it grows a little wider. Its average breadth may therefore be stated at about 12 miles. On this supposition the whole area of the formation is 1440 square miles. In passing from Oxford to Chapel Hill, the traveller passes nearly on the line of its western boundary. This runs onward at the foot of Chapel Hill, a mile and a half east of the University; meets Haw river about three miles above Haywood, and Deep river about five miles northwest of Tyson's Mills; thence it passes through Moore county by Richland creek; thence into Montgomery by Cheek's creek; and finally through Anson a few miles above Wadesborough, into South Carolina. The eastern boundary will be indicated with sufficient exactness by mentioning the points where the roads meet it, that diverge westward from Raleigh. On the road to Fishdam, on the Neuse, the sandstone begins to appear two miles north of Boyce's mills, and five from the Fishdam on the same road. On the western road to Hillsborough, the line of formation passes a little east of Brassfield's. The same line is met with on the way to Chapel Hill, near Mrs. Jones's on Crabtree creek, twelve miles from Raleigh. Farther south it is found five miles below Haywood, on the Cape Fear, and not far from Sneedsborough in the county of Anson."

The evidence that the sandstone and coal series repose on the metamorphic [illegible] auriferous district, are observed at nu-

merous points; among which may be mentioned the millstone quarries on the waters of Richland creek, in Moore county; the tributaries of Indian creek, within one mile of Peter G. Evans's bridge on the road leading towards Salem; and again at a mile above the mouth of Line creek, which enters Deep river, not far above the same bridge. It is also seen at a point about half a mile from Dennis's store, one and a half miles from Farmersville, on the Pittsboro' road. Here a deep ravine divides the coarse conglomerate and red sandstone of the sedimentary series, which has a gentle southerly dip from the old slaty, quartzose and indurated rocks, which have a high inclination to the northwest. The first stratum, resting on the metamorphic slates, is a body of clayey marl, as found particularly at Seawell's millstone quarry, where the conglomerate has been actually excavated to the bottom of the stratum, and found reposing on the clay. This clay rests directly on the edges of the old subjacent auriferous slates. The conglomerate, forty feet thick, dips to the southeast, in an angle of 17 degrees; but I observed, that at its northwesterly edge, the lower part of the stratum seems to have its plies nearly horizontal, while those above were inclined in the manner just mentioned. It is however to be observed, that positive and credible information was given at the quarries by Mr. Seawell, that coal had actually been found at Neil McIntosh's on Richland creek, on land formerly owned by Alexander McIntosh. I am indebted to the same authority for information, that Richard Winston formerly obtained and exhibited to him coal from a branch of Drowning creek, at Mr. C. McCrummen's place near the old road leading from Carthage to Montgomery court-house. Mr. Seawell also stated to me, that from the Glade Branch, where the most northeasterly quarry of millstones is at present worked, to the Grove Branch, on the place belonging to Daniel McCrummen, the most southwesterly of those quarries, the distance is nine miles; and also, that along the line between those points, the millstone grit is found wherever the streams cross that line, while immediately on the northwest side of the line of grit, the slates of the gold formation are every where found—as at his place—which is one mile from the Bruce gold mine—dipping in the reverse direction to that of the sandstones, that is, towards the northwest.

SITUATION OF THE COAL IN RESPECT TO THE WATER LEVEL.

Nearly all the outcropping edges of the coal seams on Deep river, are at a very moderate elevation above water level. At many places it is less than fifty feet, and at none do I suppose it to be more than one hundred feet above the level of high water at the place. The outcropping appears to be farther elevated

above water level at the upper than at the lower part of the course of the river through the coal field. The fall of the river in the distance traversed through that field, is twenty-seven feet. The practical consequence of this generally low level of the edge of the basin, is, that mining must, for the most part, be carried on below water level, and thus the drainage must be effected by pumping.

POSITION OF THE COAL SEAMS, OR THEIR STRIKE AND INCLINATION.

The direction pursued by the outcrop of the coal seams in this formation, varies as in all other coal basins; thus at Evander McIver's, on the south side of Deep river, the beds near the road, and not far from his house, run nearly east and west, and dip to the south. At a point some hundreds of yards north of that, and on the borders of a small run, not far from John McIver's, deceased, the slates were observed dipping to the northwest, in an angle of 19°. At a point further down the rivulet, the bluish slate rock was observed inclined to the southwest, in an angle of 29°. At the lower end of the Farmersville property, the rocks exposed in the run, dip south. By reference to the plan of your Farmersville property, you will observe that the line of direction between the two pits most remote from each other, is N. 64° W., and the dip is there to the S. 26° W. about 10 or 12 degrees. At a point four miles by the road higher up the river, the course of strike is S. 80° W. dip S. 10° E. 42°. One mile further it appears to be S. 70° W., and five miles further, it is S. 57° W. At Wilcox's place, it appears to be S. 54° W., and near Dr. Chalmers' place, where some of the beds cross the river, the strike is S. 43° W. A general S. W. direction appears to be thence preserved, till we reach the neighborhood of Seawell's quarries, seven miles from the last named locality, and it is stated to be maintained some six or seven miles further southwest.

THICKNESS OF THE COAL AT FARMERSVILLE.

The following are the measures taken on the bed at Pit No. 5, which has been more fully opened than either of the others. When measured near the outcrop, or where the pit was first sunk.

1. Bottom coal resting on fire clay, . . .	2 feet 6 inches.
2. Intermediate slate, ...	2 "
3. Top coal, ...	3 "
Total coal, ...	5 feet 6 inches.

When this opening had been carried about four yards downwards towards the dip, the thickness of the measures was as follows:

1. Bottom coal, on fire clay, ...	2 feet 6 inches.
2. Intermediate slate, ...	1 " 7 "
3. Top coal, ...	3 " 8 "
In all, ...	7 feet 9 inches.

This gives of coal 6 feet 2 inches. These measures were the last which I had an opportunity of taking, and are the only ones taken at this pit, on which I can offer the assurance of personal observation. I have, however, the statement of a gentleman, who has since visited the mine, that in carrying the exploration still farther towards the dip, and until a covering or roofing of slate was a few inches thick above the coal, the different parts of the bed had come to measure as follows:

1. Bottom coal, ...	2 feet 8 inches.
2. Intermediate slate	1 " 6 "
3. Top coal, ...	4 " 6 "
In all, ...	8 feet 8 inches.

Showing of coal an aggregate of 7 feet 2 inches. A still later account assigns as the whole thickness of the seam then reached, nine feet, and of the intermediate slate but fourteen inches. If these measurements have been accurately taken, it should seem that at this locality at least, not only is the slate diminished rapidly in thickness, but the coal more than proportionately increased as we descend along the inclination of the bed, leaving the thickness of the coal in the two parts of the bed seven feet ten inches.

The thickness of even six feet two inches of coal worked in a chamber seven feet nine inches in height, as at the point where I last measured the bed, is abundantly sufficient for very profitable working.

The whole of the coal will not of course be removed, but with careful mining it would not be necessary to leave more than one-fourth in the ground. The gradual inclination in the beds does not lead to the supposition that you will ever have to descend to an excessive depth, and be thereby compelled to leave a large proportion of the coal for pillars. I may remark that the coal at Farmersville is overlaid by an excellent slate roof, several feet in thickness, and apparently well adapted to sustain the superincumbent rock, as well as to keep out surface water.

DRIFT COVERING OF THE COAL AND SANDSTONE FORMATION.

In every part of the coal field which I have yet visited are seen the effects of diluvial currents, which have transported over it the materials of the older rocks lying towards the northwest. The coal beds have, in some instances, their edges thus covered up to the depth of several feet. This covering has evidently been derived from the auriferous rocks beyond the edges of the freestone

and millstone grits. It has sometimes been found to contain gold in sufficient quantity to tempt, but not to reward the labor of working. At one place on the plantation of Dr. Chalmers, the pebbles of quartz are in a bed, fifteen to twenty feet thick, and form a knoll some three hundred feet in diameter. Among the drifts are occasionally found small boulders one or two feet in diameter. In this feature the North Carolina coal district has a strong resemblance to that in the neighborhood of Richmond, where the edges of the coal seams are found overspread by a similar diluvial covering.

At and near the Farmersville estate, no trap dike has exerted its power of debituminizing the coal. In other places, especially towards the southwest, trap or "negrohead," is of frequent occurrence, and has impressed the coal with the character of semibituminous or of anthracite.

ANALYSIS OF COAL.

Specimen.	FARMERSVILLE COALS.	Specific Gravity.	Volatile Matter.	Fixed Carbon.	Earthy Matter.	Ratio of fixed to volatile matter	REMARKS.
No. 1	From pit No. 1 (Sketch No. 4), lower ply, specimen recently mined.	1.416	30.91	50.77	18.32	1.64	Coke of this coal light and puffy; ashes purplish gray.
" 2	From pit No. 1, lower ply second specimen.	1.497	28.47	64.70	6.83	2.27	Coked very slowly; ashes brownish red.
" 3	From pit No. 1, upper ply.	1.547	28.06	54.78	17.16	1.95	Very intumescent; coke light; ashes purplish gray. Specific gravity is the mean of two trials.
" 4	From pit No. 2 (Farrish's old opening, see plan No. 4).	1.309	31.62	64.57	3.81	2.04	Specific gravity is the mean of two trials; ash yellowish white.
" 5	From pit No. 2 (a former analysis).	1.318	32.82	63.78	3.40	1.94	(For this analysis see "Coal Trade of British America," p. 165.)
" 6	From pit No. 5 (opened by Mr. Williams), lower ply.	1.415	30.85	63.90	5.25	2.07	Specific gravity mean of two trials: ashes nearly white, very light.
" 7	From pit No. 5, lower ply, second specimen.	1.467	30.22	47.14	22.64	1.56	Specific gravity mean of two experiments; ashes reddish, a little fused or clinkered.
" 8	From pit No. 5, lower ply, third specimen.	1.308	31.30	64.40	4.30	2.00	Specific gravity mean of two trials; coked slowly; ash nearly white.
	Averages of eight trials.	1.409	30.58	59.25	10.21	1.81	
" 9	From pits Nos. 1, 2, and 5, a mixture of 40 specimens from different plies in all those pits, pulverized together.	1.409	31.70 29.83 31.85 30.79	55.61	13.77 13.33 13.70 13.60	1.80	Volatile matter and ashes tested, each three times; ashes reddish grey.
" 10	Highly bituminous fossiliferous slate, found between the two plies of coal in pit No. 5.	1.791	28.60	19.45	51.95	0.65	Contains more volatile matter than fixed carbon; fragments of residue not pulverulent.

All these analyses, it must be remembered, are necessarily made upon coals taken from within a few feet of the outcrop of the bed, and they may therefore be regarded as by no means exceeding the true estimate of the value of the coals. The effect of exposure of bituminous coal to surface influences, is to reduce the proportion of volatile combustible matter, and substitute therefor water and carbonic acid, and also to augment to some small degree the proportion of earthy materials of the coal. From the foregoing statements and considerations, I have no doubt that the coal at Farmersville will, when pursued under a greater depth of covering, and where meteoric influences have not been able to effect it, not only bear out the analyses, but prove still more satisfactory.

Having separately analyzed eight different specimens of the Farmersville coal, from the three open pits, and obtained the results exhibited in the above table, I next formed a mixture of forty specimens, some from each ply of the several pits, weighing out 100 grains of each specimen. I mixed and pulverized the whole 4,000 grains together, taking care thoroughly to intermingle the powder, so as to form an average specimen of the whole. Portions of this powder were then successively treated, for the purpose of obtaining the average composition of the coal.

1st.	Dried by passing dry air over it in a glass tube, kept at a temperature of 212°, it lost	1.71	pr. cent.
2d.	Three successive trials for volatile matter, other than moisture, gave	29.08	do
3d.	Three determinations of earthly matter, gave an average of	13.60	do
4th.	The resulting amount of fixed carbon, is consequently .	55.61	do
		100.00	

5th. 25 grains of the mixture treated for sulphur, gave of sulphate of baryta 5.79 grains, equivalent to 0.825 of a grain of sulphur, which is exactly 3.3 per cent. of the coal used.

6th. 31.4 grains of the mixture gave 7.52 grains of sulphate of baryta, equivalent to 1.037 grains of sulphur, which again gives 3.3 per cent.

7th. 14.85 grains of the dried powder, intimately mixed with litharge, and treated according to the method of Berthier, gave of metallic lead reduced, 407.5 grains. Had the same weight of undried coal been used in this assay, it would have given 400.5 grains of reduced lead, or 26.97 times the weight of raw coal. From the known relations of carbon and lead to each other, in the respective states of carbonic acid and litharge, it is ascertained that one part by weight, of pure carbon, will reduce 34.53 parts of lead from the state of oxide to that of the metal. The reductive powers of this coal in its raw state, is consequently

represented by the fraction $\frac{2697}{3453} = 0.781$, or it has the same reductive power as if it were composed 78.1 per cent. of pure carbon, and the rest of inert matter.

In order to make a comparison of this result, with those which have been obtained by the same mode of trial, both on American and foreign coals, of which the heating power has been also *directly ascertained on a large scale*, I beg leave to refer to my "Report on American Coals," which shows at pages 459 and 553, under the head of "Lead reduced from litharge by one of fuel," the following coals, of which the lead-reducing power approaches to that of Farmersville coal.

Name of Coal.	Lead reduced by one part of coal.	Steam generated by one part of coal.
1. Chesterfield Mining Company, Va.,	25.78	8.99
2. New Castle, Eng.,	26.78	8.65
3. Clover Hill, Va.,	26.96	7.67
4. Liverpool, Va.,	27.07	7.84
5. Pictou, Nova Scotia,	27.24	8.41
6. Midlothian (Va.) screened,	27.28	8.94
7. Midlothian (Va.) average,	27.34	8.29
8. Pittsburg (Pa.),	27.54	8.20
Averages,	26.99	8.12

By a reference to the report of the British Commissiners, contained in my work on the "Coal Trade of British America," at pages 72 and 78 of that work, you will find the analogous results of their trials of reductive and evaporative powers of *British* coals.

	Lead reduced.	Steam generated.
1. Broomhill coal,	25.31	8.75
2. Coleshill,	26.14	8.00
3. Dalkieth Jewel seam,	26.42	7.98
4. Three-quarter rock vein,	26.62	8.84
5. Ponty-pool,	27.46	7.47
6. Bedwas,	28.20	9.79
7. Cwm Froud Rock vein,	28.30	8.70
8. Grange mouth,	28.45	7.40
Averages,	27.11	8.09

From both of the preceding comparisons it appears that a lead-reducing power of about 27 corresponds in practice to an evaporative power of 8. 1, which may be safely assumed as the number of pounds of steam which one pound of Farmersville coal would produce from water taken at the boiling point.

ULTIMATE ANALYSIS OF FARMERSVILLE COAL.

On testing the above mixture of 40 specimens of Farmersville coal, to determine the absolute quantities of carbon and hydrogen, the following results were obtained.

1st. Tested by the method of organic analysis, 4.85 grains of the mixture previously dried at 212° gave as follows:

Carbonic acid,	12.42 grains.
Water,	2.00 "

Hence the carbon is	3.395 grains	= 70.00 per cent.
hydrogen	0.222 "	= 4.58 "

2d. Tested 6.80 grains of the same mixture, and obtained of

Carbonic acid,	16.99 grains.
Water,	2.87 "

From which the carbon is	4.706 grains	= 69.20 per cent.
hydrogen	0.319 "	= 4.69 "

The average of the two results is,

Carbon,	69.60
Hydrogen,	4.63

The fixed carbon being as above, 55.61 per cent. of the raw coal, or 56.57 per cent. of the dried coal, it appears that 13.03 per cent. of the carbon becomes volatilized in the process of coking. The preceding analyses show this coal in its raw state to be composed as follows:

Moisture, per cent,	1.71
Sulphur,	3.30
Carbon,	68.41
Hydrogen,	4.55
Oxygen,	8.43
Earthy matter,	13.60
	100.00.

They also prove that the hydrogen in excess above what is required to form water with its oxygen is 2.50 per cent.

In order to obtain a more definite idea of the character of the coal in those parts of the seam which show the greatest freedom from impurities, I analyzed by the organic method a portion of the Farmersville specimen, No. 4, of which the earthy matter was but 3.81 per cent. For this purpose, the finely pulverized coal was first carefully dried by transmitting over it at 212° air which had previously passed through a long tube filled with dry chloride of calcium. It thereby lost 2.35 per cent.

2d. 7 grains of the dried coal treated in a combustion tube with oxide of copper and a small quantity of chlorate of potash at the bottom, gave of carbonic acid 21.08 grains, water 3.45 grains, showing that the carbon recovered was 5.749 grains, hydrogen, 0.383 grains.

25 grains of the raw coal treated for sulphur, gave of sulphate of baryta only 0.4 grain, equivalent to 0.055 grain of sulphur, or 0.22 per cent., or only one-fifteenth part as much as the above average of forty specimens. This indicates great purity.

From these data it follows that the raw coal consists of

Moisture,	2.35	per cent.
Sulphur,	0.22	"
Carbon,	80.20	"
Hydrogen,	5.32	"
Oxygen and volatile ingredients,	8.10	"
Earthy matter,	3.81	"
	100.00	
Hydrogen in excess,	4.31	"

From the table of proximate analyses (see table of analyses No. 4) it appears that the fixed carbon, by experiment in coking this specimen of coal *slowly*, was 64.57 per cent., which proves that 15.63 per cent. of the whole coal was votalizable carbon.

By rapid coking, the same specimen of coal gave of fixed carbon only 61.09 per cent., showing that this process sends off 19.11 per cent. of the coal as volatilized carbon, or 3.37 per cent. more than that expelled by slow coking. This general fact is fully demonstrated in respect to other coals in the "Report on American Coals." In order to form an approximate estimate of the heating power of the coal of which the analysis has just been given, I may again refer to that Report, in which it was proved that Clover Hill (Virginia) coal, with a total per centage of *carbon* of 78.68 had an evaporative power of 76.75 and New Castle, English Coal, with 81.34 per cent. of *carbon*, had an evaporative power of 86.56. The mean of the two proportionals of carbon is therefore 8.10; that of the evaporative powers 8.16. The British Commissioners in the Report before referred to, prove that the coals called Fordel-Splent, Grangemouth, Bedwas and Pontypool, have an average of 80.13 per cent. of carbon, and that they produced 803 lbs. of steam per pound of coal burned.

Comparing the Farmersville coal now under consideration, with the American and British trials of evaporative power, it appears that as in,

	Per ct. carbon.	lbs. of steam to 1 of coal.	
Two American trials	80.01	gave	8.16
And four British do.	80.13	do.	8.03
Therefore, this Farmersville coal with,	80.20	should give	8.10

which accords very exactly with the average result derived from experimenting with the average specimen tested by oxide of lead.

This coal, besides possessing the advantage of brisk and brilliant combustion, which renders it a most desirable fuel for parlor grates, is an excellent coal for smith's purposes. It takes fire promptly, it swells sufficiently and agglutinates its masses together so as to form a good hollow fire. The amount of sulphur is not such as to prevent its usefulness in this application, or to interfere with its preservation either on shipboard or on shore. By the table of analyses it appears that the ratio of the fixed to the

volatile combustible matter of the Farmersville coal, is from 1.56 to 2.27, and that the average of eight results, on distinct specimens, is 1.81, while the ratio derived from operating on an average sample of forty specimens, taken from all the plies of the different pits, is 1.806, or in reality identical with the other. By reference to the table, opposite to page 134, in the work on the "coal trade of British America," it will be found that eight of the samples of bituminous coals from the Richmond coal-field, have ratios of fixed to volatile matter, ranging from 1.57 to 2.24, and that their average is 1.84, varying but very slightly from the above average of the Farmersville coal. The eight samples of coal referred to are the following:

NAME OF COAL.	Ratio of fixed to volatile combustible.	Earthy matter per cent.	Evaporative power.
1. Midlothian screened, ...	1.57	9.66	8.94
2. Tippecanoe, ...	1.60	9.37	7.75
3. Midlothian new shaft, ...	1.68	9.44	8.76
4. Midlothian average, ...	1.78	14.74	8.29
5. Clover hill, ...	1.79	10.13	7.67
6. Chesterfield, ...	1.92	8.63	9.00
7. Creek Company, ...	2.03	8.57	8.42
8. Midlothian, 900 feet shaft, . .	2.24	10.47	8.58
Averages, ...	1.84	10.12	8.43

Deducting the per centage of earthy matter from 100, we have the combustible matter 89.88 per cent. The average sample of Farmersville coal, which has been analyzed, gave 13.6 per cent. of earthy matter, leaving but 86.4 per cent. of combustible. Hence, admitting the heating powers of the combustible matter to be similar (as the equal ratio would seem to imply), we have

$$89.88 : 86.40 :: 8.43 : 8.11$$

which again places the average evaporative power of the Farmersville coal, as found at the outcrop of the beds, at the same value as that given by the trials with litharge. It will be observed in the table of analyses, that the intermediate slate found between the two plies of the main seam of coal at Farmersville, has 28.6 per cent. of volatile matter, and 19.55 per cent. of fixed carbon, and that the ratio is thereby reduced to 0.65; which shows that this slate might be profitably employed for producing illuminating gas in the manner practised in some countries of Europe, provided that the use of it for that purpose were required at points where the cost of transportation would not prove a bar to its employment.

The specific gravity (1.409) of Farmersville coal is such as to warrant the inference that when in the state of lumps, it will weigh from 48 to 50 pounds per cubic foot, and that when made up of a due admixture of lumps and fine coal, it will weigh from

fifty-three to fifty-five pounds per cubic foot. At an average of forty-nine pounds per cubic foot, the *lump coal* alone will require 45.7 cubic feet to stow one ton; and with a weight of fifty-four pounds per cubic foot, the *average* or *mixed* coal will require 41.5 cubic feet to stow one ton. These results are derived from very numerous trials, by actually weighing and measuring different coals of the same average specific gravity in the state of lump and fine or mixed coals. They will be found at page 590 of the "Report on American Coals." The results are important, as furnishing the bases of calculations relative to the capacity of your barges as well as that of the coal bunkers on board of steamships. The mean specific gravity of the Wilcox anthracite is 1.509, and by means of a similar comparison with the results obtained by measuring and weighing other anthracites of about the same average specific gravity, it is inferred that a cubic foot of this anthracite will weigh 54.5 pounds, and that 41.1 cubic feet will suffice for the stowage of one ton.

COST OF MINING.

The expense of cutting and delivering the coal on board of barges will depend on the judicious selection of a site for opening the mines, the arrangements for keeping them clear of water, the care bestowed on the separation of impurities, and the point selected as a loading ground. The Deep river makes an extensive detour to the south-east, forming a sort of peninsula of the part of the Farmersville estate lying between the line of pits and the bend of the river. It is on this part of the estate, from 280 to 300 acres, that the beds of coal thus far discovered on the property, are situated. It will consequently be an easy matter to reach the river within less than half a mile from almost any point where an opening shall be permanently fixed upon. The thickness of six feet two inches of coal, if unincumbered with intermediate slate, would afford a most commodious body of coal for easy and profitable mining, and would not, I suppose, cost more than from thirty-two to forty cents per ton, or one and a quarter cents per bushel. As the ply of one and a half feet of slate must be removed in getting your coal, I think it safe to compute the cost at from forty to forty-five cents per gross ton, and the delivery into barges ought not to cost more than fifteen cents per ton. The Wilcox anthracite will have a very gradual descent from the mines to the river of about half a mile.

The Wilcox property, on which are found the anthracites analyzed and presented in the following table, is understood to embrace 550 acres; and the adjoining Tyson property, on which I suppose the same beds of coal to exist, is of the same amount. These properties are about 12 miles higher up the river than the

Farmersville estate. The coal from these properties, which lie directly on the river, will enter the Deep river navigation in the pool of Evans' dam. The land is generally covered with heavy timber. A portion of the Wilcox property has a farm-house, barn, and various other buildings, sufficient to accommodate miners and other persons employed about the mines.

Specimen.	GEORGE WILCOX'S Anthracite.	Specific Gravity.	Volatile Matter.	Fixed Carbon.	Earthy Matter.	Ratio of fixed to volatile Mattter.	REMARKS.
No. 1	From old opening long exposed.	1.454	8.28	83.12	8.60	10.08	Purplish gray ash, with white specks.
" 2	From same opening (by my former analysis).	1.549	6.64	83.76	9.60	12.61	(This anal. will be found p. 166 "C.T. of B. Am.")
" 3	From same opening, another specimen long exp.	1.646	8.67	68.92	22.41	7.95	Ashes reddish gray.
" 4	From new opening, 2½ft. seam, first specimen.	1.427	7.35	87.18	5.47	11.84	Ashes reddish gray.
" 5	From new opening, 2½ft. seam, second specimen.	1.484	9.50	84.54	6.46	9.29	When slowly cooked lost 9.1 per cent. ashes gray.
" 6	From middle ply, seam one foot (out-crop).	1.497	7.68	74.36	17.96	9.68	Ashes gray, white particles interspersed.
" 7	From upper ply, seam six inches.	1.507	7.15	79.44	13.41	11.11	Ashes purplish gray.

TRANSPORTATION TO MARKET.

From Fayetteville to the mines, seventy-one and a half miles, the elevation overcome is shown to be 174½ feet, or an average of lockage of 2.43 feet per mile. Upon this line of public works, the coal will reach Fayetteville, the present head of steamboat navigation, and from that point to Wilmington, 100 miles, the way is of course plain. The navigation of that part of Cape Fear was improved some years ago, at a cost of 200,000 dollars, to which adding the same sum, which is the estimated cost of the navigation to the upper end of the coal district, and you have the cost of the entire improvements on which your coal will be required to pay toll. This sum is scarcely more than the fortieth part of the cost of some of those expensive works over which the coal from several of our most extensive American mines is now compelled to pass on its way to the seaboard. The barges are constructed to carry in this navigation from 100 to 120 tons each.

* * * * * * *

The situation of the coal district of Deep river, is reported to be remarkably healthy. Agricultural productions may be there obtained at very favorable rates, especially when the navigation now in progress, shall have been completed. Indeed, some of the finest farms which I have seen in North Carolina, are on the borders of Deep river, and can be at once converted to the supplying of produce, required by a mining population. You have a bed of

coal equal in thickness to the great Pittsburgh seam, not inferior to the main seam at New Castle, and of the same thickness as the bed being worked at Sidney, Cape Breton. The coal is of a quality well adapted to domestic use, to metallurgic arts, and to steam navigation. It lies in close proximity to a public improvement of little cost; an outlet to which has recently been relieved from all vexatious charges, and consequently your way to the markets of the world is so cheap and direct as to place yours in advantageous competition with the most favored coals of the United States.

* * * * * * *

All which is very respectfully submitted,

WALTER R. JOHNSON.

ART. 4.—GOLD AND SILVER PRODUCED BY THE MINES OF AMERICA FROM 1492 TO 1848.

No. 2.

IN a previous article (vol. I. No. 3, p. 219) an estimate was made, from the best authorities, of the amount of gold and silver yielded by the mines of South America and Mexico from 1492 to 1848, with only an allusion to the product of the mines of the United States. The subject is again resumed, to present some facts respecting these mines, and with the hope of eliciting more full and ample particulars than are at this time in possession of the public.

The States of the Union in which gold mining operations have been carried on to any extent, or from which considerable gold has been obtained during this period, are Virginia, North Carolina, South Carolina, Georgia and Tennessee. Some gold has been found in one or two of the adjoining States; but no mining operations of extent have been carried on there.

The geological position of gold is in the primitive rock. In the Southern States it is chiefly found in the stratified transition series, and it is now obtained from regular, well developed veins, running parallel with the general direction of the rock strata, southwest by northeast. The plane of inclination of these veins is also parallel with the plane of inclination of the general formation. It appears from this that the gold bearing veins are of a simultaneous origin with the rock; at least they have been introduced when the rock was in a plastic condition. In Virginia and North Carolina the gold bearing veins are a ferruginous talcose slate, often inclined to mica slate. In North Carolina this slate is found to be very hard in many instances, showing a compact solid mass of rock, apparently the same slate, but having been under the influence of a considerable heat, it is hardened.

In Virginia the slate is more soft, the fissures open more readily, and the whole vein shows the appearance of soft slate. This slate is impregnated with small quartz veins, from one-eighth to one-half an inch, and often two inches thick. Where these quartz veins are thin and in great numbers, the ore is always found to be richest in gold. This feature of the ore is well developed throughout Virginia, and at Gold-hill, North Carolina. The vein stone of the gold bearing veins is strongly impregnated with oxide of iron, showing evidence that this iron is derived from pyrites. Many of these veins have been traced to that depth where the pyrites are not oxidized ; here it appears in its perfect crystal form and is profusely distributed through the slate. The oxidation of this pyrites appears to depend upon the penetrability of the rock by atmospheric agents ; where the slate is soft, it is oxidized to the depth of fifty to one hundred and fifty feet ; where it is hard, the oxidation hardly reaches ten to twenty feet. Where the pyrites is not oxidized, the extraction of the gold is attended with considerable more expense than from soft slate and oxidized pyrites. The crushing of the hard slate is more expensive ; the sulphur of the pyrites destroys a large portion of quicksilver in the amalgamation, and the gold cannot all be extracted ; the largest portion of it remains inclosed by the sulphuret of iron, and can be liberated only by destroying that envelope.

The southern gold formation extends at least five hundred miles ; the breadth of the gold bearing strata in which the gold is imbedded is from five to twenty miles in width ; and if we consider the depth of the veins, which by some are assumed to be two thousand feet, the amount of gold ore in this region is justly entitled to be regarded as a great source of national wealth. Various experiments have been made to faciliate the working of the sulphurets, but none of them have so far succeeded yet, as to make it profitable to work the poorer classes of ores. In Virginia and North Carolina gold ores are worked with profit which yield only seven and ten cents of gold to the bushel. The pennyweight of gold from the Virginia mines has generally been worth from 90 to 92 cents. North Carolina gold contains more silver, and a pennyweight has seldom exceeded 90 cents, and in many ranged from 80 to 90 cents, while the gold of California has been from 75 to 90 cents.

Silver has been derived in the United States exclusively from the sulphuret of lead. Until recently the only establishment for its extraction was that of the Washington Mining Company in North Carolina. The ore which this Company worked has yielded from 200 ounces to 300 ounces of silver to the ton of lead. It contains on an average eight per cent. of lead ; the other matter is zinc, iron, copper, tin and sulphur. The silver has been worth

$1 80 the ounce, because it was alloyed with a large portion of gold which raised its value far above that of pure silver. We are uninformed respecting the amount of silver obtained from the ores in North Carolina.

The extraction of silver from its ore is generally conducted on the same principles—but the operations at the Washington mine which are thus described, present one of the most difficult cases, on account of the composition of the ore. It consists chiefly of brown sulphuret of zinc, which is largely mixed with galena, copper, and iron pyrites; it contains silver, gold, and other metals. The ore as it comes from the mine is broken into coarse fragments, and roasted in heaps in the open air. The roasting is performed altogether by wood and wood charcoal. After the first roasting the piles are picked over for the ore which is well roasted, and that which is too much roasted. This is brought to the stampers, crushed into a fine powder, and washed, so as to carry off all the oxidized zinc and quartz. If the ore, after its being crushed, is found to be imperfectly roasted, it is returned to the yard and once more subjected to roasting. That part of the ore which is rejected in the yard is piled and roasted along with some fresh ore from the mine. In this way it may happen that some of the ore is exposed to several heats. The roasting operation is not considered to be finished until all the sulphuret of zinc is destroyed; that is, until the zinc is deprived of its sulphur and converted into oxide of zinc, in which form it may be washed away by the water at the stamping-mill.

The finely powdered ore consists now chiefly of galena, or in case the roasting operation is well performed, of oxide of lead, oxide of iron, oxide of copper, silver and other matter. This ore is brought to the smelting-furnace, called a high-furnace, and here smelted along with some fluxes by charcoal. In fig. 1 such a

FIG. 1.

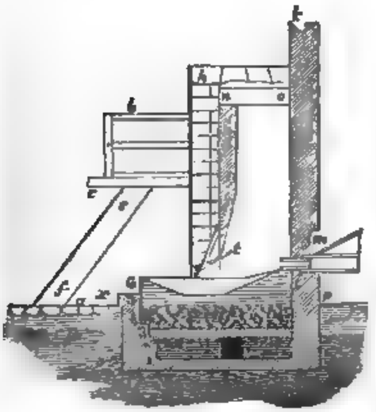
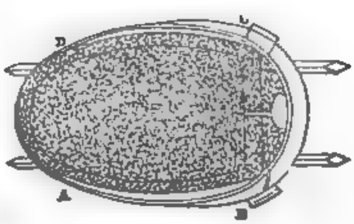


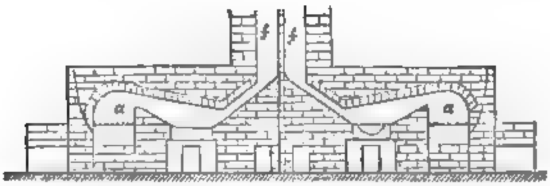
FIG. 2.



furnace is represented; it is a solid work of masonry, ... to retain its heat if once thoroughly heated. The fire is urged by cylinder bellows, driven by a steam engine; the air to the furnace is supplied at the tuyere *m*. In consequence of the alternate charges of coal and ore, the basin or hearth *g* is regularly supplied with metal, which is removed at certain intervals of time, so as to afford room for fresh metal and cinder. In this manner about one ton of lead is obtained in 12 hours, which is removed and put aside for refining. The composition of the ore, which makes its perfect roasting difficult, renders it necessary to make large additions of iron ore to the posts of ore. The iron oxide, which is reduced in presence of carbon in the furnace, will absorb the sulphur from the other metals in case there is any sulphur left after roasting. This circumstance renders the operation tedious and slow. It cannot be avoided but by perfect roasting, which may be considered practicably impossible in this instance. The presence of zinc is what renders the operation tedious and expensive. If the zinc is not removed to a large extent, it will, in smelting the ore, carry off by evaporation much of the other metals, gold and silver not excepted. The sulphurets of zinc and lead are very fusible if in contact. In roasting the ore these two sulphurets will invariably melt together, which causes the roasting process to be either very expensive or imperfect. All experience with similar ore in other parts of the world is confirmatory as to the operation being expensive.

The lead from these blast-furnaces is transferred to the refining-furnace. Formerly the English refining furnace was used as it is represented in fig. 3, in a longitudinal section. Here is a

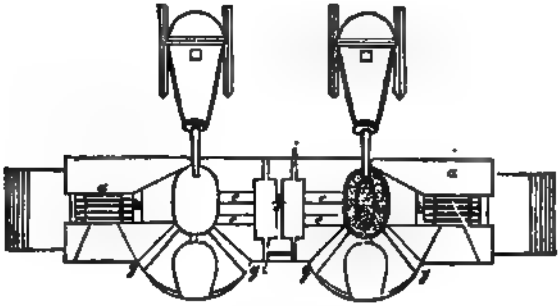
FIG. 3.



double, or two furnaces represented, which, as is shown, are reverberatory furnaces. The fireplace *a* throws the flame over the hearth or cupel into a chimney, which is provided with a sliding door at *f f* to shut off the draft and prevent the fumes of metal from escaping through the stack. The cupel is formed of several layers of bone-ashes, mixed with wood ashes; this mass is rammed into an iron hoop when in a moistened condition. The form of this cupel is represented in fig. 2; from above it is a concave egg-shaped dish, of about 5 inches thick, the largest diameter

being 4 feet, the smallest 2 feet. When the furnace and cupel are heated, the lead, previously melted in an iron pot, is cast into it; and now the bellows, which are represented in fig. 4, are set to work, and a gentle current of air is thrown over the hot surface. The action of the blast is here twofold; it oxidizes the lead and forms litharge of it, and drives by its force the melted litharge to the opposite side of the blast, or the tap-hole, where it flows out and falls into an iron basin, from whence it is carried back to the smelting-furnace. The level of the lead is in this way gradually reduced if not kept up to a certain height; this is done by casting in melted lead, which is always ready melted in an iron pot. This process is carried on until a certain quantity of

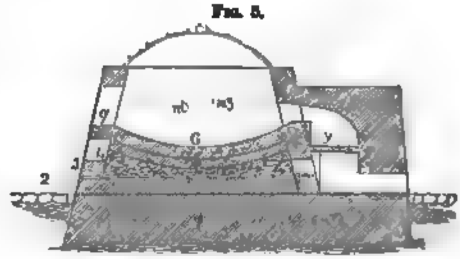
FIG. 4.



lead has been concentrated so far that a little more than one weight of lead is combined with an equal weight of silver; this rich lead is taken out and refined in a properly prepared cupel. If sufficient rich lead is ready to make from 500 to 1000 ounces of silver, it is refined in a new cupel, and the silver melted into a cake. The operation is carried on as before, with the only difference that no fresh lead is added.

The Washington mine has more recently introduced the German refining furnace represented in fig 5—with what success we are not aware. This furnace is larger than the above English furnace, the cupel being at least 6 feet diameter. The drawing shows a section of the furnace, in which the

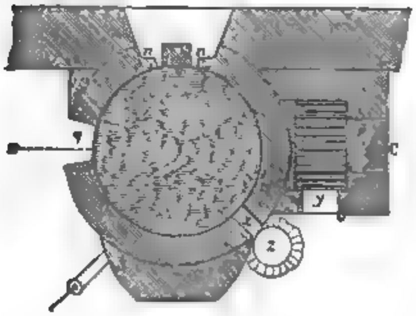
FIG. 5.



fireplace *y*, the tuyeres *n n*, and the door *q*, into which the

lead is charged, are shown. In fig. 6 is a ground plan of the furnace shown. Here is the flue *x* visible, which leads to the stack, and which serves in the mean time to clear off from the surface of the melted lead some of the scum. The cupel of this furnace is made entirely of wood-ashes, which are the refuse ashes from the soap-works, and in this respect the furnace has an advantage over the English furnace. The floor or hollow surface of it is well pounded by wooden mallets, to make it solid and smooth. About four tons of lead are charged for one heat; it is carefully laid upon the bottom, and at first gently heated, so as not to injure the fresh bottom, and dome. When the lead is melted, and all ebullition ceases, the blast is thrown in at the tuyeres *n n* by setting the bellows at playing on the surface of the melted metal. At first no litharge is made, but a dirty froth of oxidized metals is raked off, to facilitate which formation of froth, fine charcoal dust is thrown on the surface. When all the impurities of the lead are removed in this way, the formation of litharge begins, which flows off at the flue *x*. The separation of the litharge from the lead must be assisted by a hook, because the blast is generally not strong enough to move the fluid oxide of lead over the large surface of the molten mass. The cupellation of four tons of metal lasts from 18 to 20 hours. Toward the end of the operation some silver is carried off with the litharge, which portion of litharge is therefore carefully preserved, to be re-melted by itself or along with other ore. The silver is, in this operation, obtained pure in the first heat; it is melted into the form of a cake in a cavity prepared for its reception in the centre of the hearth.

FIG. 6.



In all these refining operations there is an inevitable loss of metal, disappearing in the form of fumes, through the chimney. This loss is variable, and may be modified by the skill of the workman and the purity of the lead; it amounts on an average to from 4 to 7 per cent. of the lead melted.

Leaving out of consideration the product of silver in distinction from that of gold, we resume the consideration of the latter. The gold mines have been extensively worked in these States, particularly in North Carolina and Virginia. Some years a large number of persons have been engaged in the operations.

The following is an estimate of the product of the gold region

of the United States, for a short period, extending from 1824, to 1338.

Virginia,	$ 482,000
North Carolina,	2,648,000
South Carolina,	340,500
Georgia,	1,799,900
Tennessee,	13,900
Alabama,	1,000
Other places,	12,400
	$5,297,700

Average annually, $353,213.

It is not to be presumed that all the gold from the mines of the southern gold region was sent to the mint; on the contrary, a considerable amount was manufactured, and some was directly exported. The following statement presents the deposits at all the mints, of gold of domestic produce to Sept. 30th, 1851. The product of California is omitted; and that from all other domestic sources stated.

STATEMENT OF THE AMOUNT OF GOLD OF DOMESTIC PRODUCTION DEPOSITED AT THE MINTS TO SEPTEMPER 30, 1851, CALIFORNIA EXCEPTED.

	PHILADELPHIA MINT.	NEW ORLEANS MINT.	CHARLOTTE MINT.	DAHLONEGA MINT.	AT ALL THE MINTS.
To the close of 1847, ..	$7,797,141	$119,699	$1,673,718	$3,218,017	$12,808,575
Year 1848, ...	197,367	11,469	370,785	271,753	851,374
Year 1849, ...	285,653	7,268	390,732	244,181	927,784
Year 1850, ...	122,801	4,454	320,289	217,673	666,217
Nine months of 1851,..	98,340	885	202,256	129,376	430,857
Total,	$8,501,302	$143,775	$2,957,780	$4,080,950	$15,683,807

An officer of the U. S. Treasury Department not long since, in answer to a semi-official inquiry made at the Department, presented an elaborate report estimating the production of the precious metals from 1492 to 1852. His estimate embraces the following particulars:

America, exclusive of the United States,	$6,877,830,80C
California, received at the Mint,	$98.408,000
California foreign exports manufactured, &c.,	51,592,000
Other U. S. gold at the Mint,	15.855,000
" " " not brought to the Mint,	1,145,000
Total United States,	$167,000,000
Total from America,	$7.044,833,800
Average annual yield for 360 years,	$19,568,983

But all these estimates are unquestionably less than the amount which has been produced. The yield of a single one of the mines of North Carolina, as estimated by the past and present owners, from 1804 to 1846, was ten millions of dollars. This is the Reid mine. The estate on which it is located, consists of seven hundred and fifty acres of land in the county of Cabarras, about thirteen miles from the village of Concord, and the same

distance from the North Carolina railroad. This tract of land affords many advantages for agricultural purposes, and is adapted to the production of wheat, oats, rye, &c., and other products peculiar to the region of country in which it lies. It is chiefly remarkable for its yield of gold, and the long period which the mine has been profitably worked. The first discovery of gold made in the United States was upon this property. This discovery took place in the year 1804, when a mass of gold weighing 28lbs. Avoirdupois, or 37 pounds Troy, was found by a negro belonging to a gentleman in the vicinity. The vast production of this mine has given it an historical celebrity, which is unequalled by any other auriferous vein in North Carolina. Besides the mass referred to, various other pieces of pure gold weighing from one pound to sixteen have at different times been discovered, while the washings on the surface and the veins which have been examined, have been found to be of extraordinary richness. It is computed that several millions of dollars have been obtained by operations extremely irregular, and extending over a very limited space and in shafts of no greater depth than ninety feet, and by persons without experience or skill, and without the assistance of machinery. On these veins there have been four or five shafts sunk, the deepest of which is not more than ninety feet. In all of the shafts the veins have been left exposed in the bottom, and promise the same richness below which they have yielded at the workings above. This mine is on the same formation and line with the Gold Hill mine, which is also celebrated, and differs from it only in the circumstance that the latter has been worked to the depth of three hundred and fifty feet, without any material alteration either in the size or formation of the vein.

The Reid mine was actively and successfully worked until the year 1835 under leases held by several persons in partnership, when controversies arose between the partners and a suit in chancery was instituted, and further operations suspended until quite recently, by an injunction. Of this mine Professor Ebenezer Emmons, State Geologist for North Carolina, thus speaks in some notes in relation to it :—" This mine is noted for the largest piece of pure gold which has yet been discovered in this country. The weight of this single piece was 28 lbs. The surface washings have been very profitable, and important and valuable surfaces remain yet to be exhausted. One in particular which slopes from the principal veins is rich. The only work which has been performed is that of digging over the surface with picks with a view to obtain the large pieces.

" Three parallel veins have been worked in parts not exceeding ninety feet in depth. These veins vary in width from eighteen inches to two feet. No better evidence exists of their

richness than the fact that the creek which cuts them has furnished very large returns of gold by the ordinary process of washing in the rocker. The veins are quartz in the slate formation. I regard this mine as only *proved.* This view is rational when we compare the depth with that of Gold Hill, which has been worked to the depth of three hundred and forty feet. There is, therefore, left veins which I have evidence are very rich, and which are accessible at a moderate outlay of expense. I feel, at least, great confidence that large returns of gold may be expected from these veins. The strike of the upper hill vein is N. 40° E. The shafts were sunk and timbered very well, if we may rely upon the appearance from the surface. At present the mine is not worked, and if we may believe in the common testimony of persons who reside there, and who worked the mine, the success of the operations gave origin to difficulties which have led to the suspension of its working.

"In a northwest direction, and at the distance of about half a mile, another vein has been discovered which carries galena. It has not been tested.

"The characteristics of this property are strongly indicative of a rich mineral district. These characteristics have great weight in my mind, for where they exist it is not often that proprietors are disappointed in obtaining good results. This property may therefore be regarded as worthy the attention of capitalists and as holding out inducements for an attentive and careful investigation, and with a reasonable prospect that investments will give satisfactory returns."

The Gold Hill mine is in the immediate neighborhood of the Reid mine. In South Carolina, the Dorn mine is celebrated for its product, but the length and discursiveness of this article deters us from pursuing the subject further at this time.

Art. V. MINING PRACTICE IN CORNWALL, ENG.—By Mr. Tregay.

The first object of an exploring party is to look out for a lode or vein; those running nearly east and west are the greatest favorites, while a north and south one is not objected to, especially if in a district known to be productive of lead. If the discoverer is a practical miner, the next object is to examine the composition of such lode, its exact bearing, underlie, appearance of its walls, &c. As to its size or thickness, that must not be measured, for the wisest men among us consider it to be bad luck, and in a circle of miners the man who attempts to do this would

receive a severe rebuke; the opinion that he is no miner would immediately be formed; so this is invariably given by the eye, or guess, if you will. The next thing to be noticed, especially if the party have a little knowledge of geology, is the stratum, its composition, dip, &c., and how near the granite, or if in the granite, how near the killas, as those mines about or near the junction are ever esteemed as the best, and thought most favorably of. Capitalists would rather adventure in such, even if the indications were less; and not without apparent reason, for so far as our mining practice has hitherto been carried, those mines within a short distance from the junction have almost invariably proved the better ones. This, I think, arises in consequence of those at a greater distance not being wrought on deep enough, especially in the killas; for if we look at the stratum we find it in many cases rising to the surface on approaching the granite range, and dipping on receding from it. Therefore, in this case to work a mine, say four miles from the granite range, we can perceive it must be sunk a great deal deeper than the nearer one, to meet with the same stratum. If we take this view, we shall find it necessary to calculate the dip of stratum with as much precision as the underlie of lodes, and which I think is the most important. I am aware that this view is taken and acted on by some few on a small scale, but not carried out to a sufficient extent; indeed, it is acted on by none so much as by working tributors, some of whom calculate the "way of the ground," and act on the principle so far as to know pretty near where to find a shoot of ore opposite one they may have taken away on a parallel lode; and most of them know where is the best run of ground for bunches of ore in their pitches. I think if this principle was more universally appreciated, and practised on a large scale, it would lead to almost unprecedented prosperity.

The next object of the exploration, however, is to get the sett, which in most cases is a difficult affair, as some land-owners, who have plenty of money, do not like their ground to be broken, and those who are comparatively low in pocket are led away by the delusion that mining will depreciate the value of their estates, with the fact before their eyes that land in a mining district invariably brings its owner a higher rental than that of the same quality where there are no mines; this they overlook.

However, we will suppose the sett, after a great struggle, has been got, and operations are to commence, "then comes the tug of war." First the lodes are costeaned; or, if convenient, an adit is driven to intersect them for perhaps hundreds of fathoms, levels driven on their courses, air shafts sunk; all this cannot be done without expense, and a great and very necessary outlay is commonly incurred before the engine-shaft is begun. Now, in doing

what has been enumerated, it is clear that in most cases there can be nothing but outlay for a considerable time; indeed, people must hit upon a fortunate spot to have met in all this any thing but favorable indications. Then comes the cost of sinking engine-shaft, fixing engine, pitwork, &c.; driving cross-cuts, levels, sinking winzes., &c, which require time and money, for you cannot get through solid rock at railway speed: all this, and much more generally, must be done before any great returns can be made. So we can plainly see that miners must possess an almost incredible amount of enterprise, genius, courage, and perseverance to carry on such an amount of operations with spirit and confidence, while on all sides around them are "knocked bals," in their forms, constantly warning to take care. But the clue to all this is the extraordinary success attendant almost invariably on those who form their plans on right principles, and carry them out fearlessly and manfully: this is the impulse to the miner's action. He looks on those who, through industry and determined perseverance, united with skill, have risen from comparative indigence to the enjoyment of affluence, and determines to follow their example; while he looks on those who may have failed in their aims, and invariably sees some great blunder in their life (which he determines to avoid), and which was the real cause of bringing their bad luck upon them. So he goes manfully to work, begins in right earnest; and after it may be years of anxiety, toil, and outlay, his exertions are crowned with triumphant success. We must, however, be careful to remark that this success seldom attends any but those who act on right principles. Jobbing in shares is not mining; and if a man is led into mining, believing he is going to make a fortune in a day, he has made a blunder. It is, at best, a business that requires caution, perseverance, energy, and courage: for although sometimes Fortune smiles on first efforts, it is by no means a general rule.

Art. VI.—REPORT ON THE WHEATLEY AND BROOKDALE MINES, CHESTER CO., PENN.—By Prof. Henry D. Rogers.

Sir,—The metalliferous lodes or veins of the district extending from the Perkiomen mines in Montgomery county to the Charlestown mines in Chester county, occur not far from the boundary which separates the gneissic rocks of this region from the middle secondary formation of red shale and sandstone. Some of them would seem to lie entirely in the one set of strata, and some of them in the other; while others again, especially the interesting group of the Pickering creek veins—on the economical prospects

of which I propose to venture some opinions—are partly within the gneiss and partly within the red shale, penetrating the latter, however, to apparently a trivial extent. It would seem to be a pretty general fact that such of these veins as are confined entirely or chiefly to the gneiss, bear *lead* as their principal metal; whereas, those which are included solely within the red shale are characterized by containing the ores of copper. But the zinc ores viz., zinc blende and calamine, prevail in greater or less proportions in both sets of veins, existing, perhaps, in a rather larger relative amount in the copper bearing lodes of the red shale. Thus, the Perkiomen and Ecton lode; the United mine lode; the Shannonville south lode; a small lode on French creek; a lode at Port Kennedy, and the Morris lode, near Phœnixville, are all genuine *copper* veins, and they are all, without exception, in the red shale formation.

On the other hand, the Wheatley and Brookdale lode, the Chester county lode, the Montgomery lode, and the Charlestown lode, with other adjoining ones of the same group at present more imperfectly developed, all lying within the gneissic rocks, or if extending into the red shale not explored beyond its mere margin, are equally genuine *lead* veins. This interesting general fact is not presented, however, as an invariable law, unattended by exceptions, for it must be observed that several of the lead veins of the gneiss actually enter the red shale; two of them, the Wheatley and the Chester county lodes, carrying their ores of lead and the usually accompanying vein-stones into this rock, while some of the others enumerated are traceable still farther within its boundary by their characteristic surface-fragments. Nevertheless, in all these cases, the red shale formation which they penetrate is a very thin and superficial capping, or unconformable covering to the gneissic strata, within which, even here, the chief body of the veins must be contained below this shallow depth. Thus, even in these instances, the exceptions to the rule are more apparent than real. But partial deviations from the law, of another sort, are met with; some of the lead veins of the gneissic strata contain traces more or less abundant of the ores of copper, and, more strikingly, very considerable proportions of lead ore are occasionally associated with the copper ores, in the copper veins of the red shale, especially in the lodes of the Ecton and United mines. Yet, even in these last-mentioned instances, which are the most conspicuous exceptions to the general rule yet brought to light in the district, the proportions of lead ore to copper ore are quite subordinate, when estimated for each entire lode.

The *gneissic strata* of the tract embracing this group of lead-bearing veins, seem to differ in no essential features from the rest of the formation ranging eastward and westward through this belt

of country. Here, as elsewhere, they consist chiefly of soft thinly bedded micaceous gneiss, a more dense and ferruginous hornblendic gneiss, and thirdly a thicker bedded granitic gneiss, composed not unfrequently of little else than the two minerals, quartz and felspar.

Penetrating this quite diversified formation are innumerable injections of various kinds of granite, green-stone trap, and other genuine igneous rocks. The granites, as throughout this region generally, consist for the most part of a coarse binary mixture of quartz and opaque white felspar, tending easily to decomposition. This rock abounds in the form of dykes and veins, sometimes cutting the strata of gneiss nearly vertically, but often partially conforming with its planes of bedding for a limited space, and then branching through, or expiring in it in transverse or tortuous branches. A not uncommon variety of granitic dyke is a simple sienite composed of quartz, greenish, semi-translucent felspar, and a smaller proportion of dark-green hornblende. A soft, white, and partially decomposed granite is a very frequent associate of the stronger lead-bearing veins, particularly in their more productive portions; but this material belongs, in all probability, not to the ancient granitic injections of the gneiss, but to those much later metalliferous intrusions which filled long parallel rents in that formation with the lead ores and their associated minerals. It appears to be, in fact, of the same date of origin with these metalliferous lodes, and may be viewed as derived in part or altogether from the fusion of the intersected gneiss, by the intensely hot mineral matter of the vein brought into close contact with the walls of the fissure. The melted constituents of the gneiss have thus floated up along the sides of the true vein, and re-crystallized upon cooling in chief abundance upon the exterior of the lode. Soft granitic matter of this sort very frequently adjoins the hanging walls of the less steeply pitching lodes of magnetic iron ore in New Jersey and New York, and it would naturally tend to place itself in this position from its superior lightness compared with the metallic matters.

The gneissic strata and their granitic injections, throughout this district, display a softened, partially decomposed condition, extending in many places to a depth of several fathoms. This rotted state does not, however, pervade these materials to as great a depth as it does in the belt of gneiss lying south of the Chester county valley and nearer the level of the tide. To its influence we must impute the fertility of the soils resting on the formation, and the soft lines of the landscape. Its origin is due, in part, at least, I think, to the action of the sea-water, which once evidently rested over all this southern edge of the low Atlantic slope of the country, dissolving by chemical forces the more soluble ingredients of the felspar, hornblende, and mica.

Immediately adjoining some of the mineral veins at the Wheatley and Chester county lodes, the gneiss is softened and decomposed to a very considerable depth, and, in some places, in a very thorough manner; the more micaceous beds being converted into a crumbling, purplish-red, unctuous, and clayey material, easily crushed in the hand, though taken from a depth of many fathoms. This condition, which has much facilitated the cutting of the upper adits of these lodes, is the result, in all probability, of a chemical influence exerted on the materials of the strata by some of the elements which belong to the veins, or which passed up through the fissures they fill at the time of their injection. Highly heated steam and other volcanic vapors have manifestly been the agents of many of the changes we witness in the walls of our igneous veins. At the same time, it must be borne in mind that, near the surface, the penetration of external water and its carbonic acid, and free oxygen along the sides of the lodes may have assisted this decomposition; and there can be no doubt that these elements, thus introduced, by leading to chemical changes and replacements in the constituents of the lodes, have caused the formation of several of the minerals we find, the carbonates and sulphates, for example, which are usually met with in the cavities and nests of the veins.

The dip of the gneiss throughout this district is generally about S. 20° E., and seldom at any high angle, the most common being 30°—40°; but this direction and inclination are, in some cases, much affected by contact with the veins. These *cut* or intersect the beds of the gneiss, both in strike and dip, even where they seem, by the violence of the disruption at the formation of the vein, to have twisted the strata from their ordinary bearings. This intersection or cutting shows these to be true lodes.

Of the *general relations of the mineral veins* of the district to each other, enough is already known to convince us that these lodes are physically associated as members of one natural group of igneous injections, and to inspire a belief not only that this is a genuine mineral region, but that the distribution of its metallic wealth is controlled by definite and ascertainable laws.

Of the one dozen or more lead and copper lodes of greater or less size brought to light in this quite limited region of five or six miles length and two or three miles breadth, the greater number are remarkably similar in their course, ranging N. 32°—35° E., and S. 32°—35° W.; and what is equally worthy of note, they dip, with scarcely an exception, towards the same quarter, or south-eastwardly, though in some instances so steeply as to approach the perpendicular. Those which do not observe this direction, seem, as far as traced, to range N. 52°—54° E. and S. 52°—54° W., and by their mutual parallelism to each other to consti-

tute, as it were, a second subordinate group or system of veins. There are one or two other lodes again, such as the *counter-lode* of the United mine, which range at even a less angle to the meridian than the first or principal set, or about N. 26° E.

The point of chief interest is the wonderfully close parallelism of the more numerous group, embracing the larger and more promising veins of the district.

There is no marked difference in the general character of the vein-stones of the several mineral lodes, nor any features to distinguish as a class those of the red shale from those of the gneiss, nor again those observing the normal direction of N. 34° E. from those of the more exceptional direction of N. 53° E. Yet, each vein possesses certain special subordinate characteristics in both its non-metallic minerals and its ores, and even in its surface vein-stones and gossans, by which the initiated observer will recognize its individuality.

The predominant material in all these lodes is quartz, then sulphuret of iron ; next to this, perhaps, is the sulphate of baryta, though this is a much more variable ingredient, being scarcely seen in the Wheatley and Chester county veins, while in others, as in the Charlestown, Morris, and the United mines it is in great abundance ; besides these, there occur frequently the materials of the walls of the veins, but in a more or less altered condition ; such are the soft, white, felspathic granites in some of the lead-veins, conspicuous, for example, in parts of the Wheatley mine, and the altered shale and sandstone fragments involved with the ore in the Morris lode. These veins are recognized and traced on their "backs" or outcrops, by their chunks of indestructible vein-stones, chiefly cellular quartz and sulphate of baryta, and by their gossans or masses of pulverulent oxide of iron and ocherous earth, interlaced with quartz, or filling cavities in the lumps of this mineral, and still more definitely by the presence of the metallic ores, sometimes well preserved in the cavities, or in the body of these fragments, or oftener only in stains and surface-coatings of the phosphate of lead or the carbonate of copper.

The different lodes differ more, perhaps, in the amount and distinctness of the gossan which they show on their backs and in their higher levels, than in almost any other particulars. In this excellent indication of a good and remunerative metalliferous vein, an abundance of soft brown gossan, perhaps none of the lodes of the region will compare with that of the Wheatley mine. This material, the product evidently of the decomposition of the sulphuret of iron of the vein, often contains, in this Wheatley lode, especially at some depth below the surface, a very appreciable trace of silver, derived most probably from the decomposition of argentiferous galena, which is one of the characteristic ores of the

vein. Sundry assays of its gossans show an average proportion of about ten ounces of silver to a ton of the material.

The metalliferous and other minerals found in these veins, form quite a numerous list.

Selecting the Wheatley lode as presenting perhaps the greatest diversity of species, and as that which has received altogether the closest study, we find the mineralogy of these veins represented by the following large and interesting catalogue :—

Sulphate, Carbonate, Phosphate, Arseniate, Molybdate, Chromate, Chromolybdate, Arsenio-Phosphate, and Sulphuret of Lead ; Antimonial Sulphuret of Lead and Silver ; Sulphuret, Carbonate, and Silicate of Zinc ; Sulphuret of Copper ; Green and Blue Malachite ; Black Oxide of Copper ; Native Copper ; Oxide of Manganese ; Native Sulphur ; Native Silver ; Quartz ; Cellular do. ; Oxide of Iron, containing Silver ; Hæmatite Iron ; Brown Spar ; Sulphate of Barytes, and Iron Pyrites.

THE WHEATLEY LODE AND ITS MINES.

Since my former Report on the Wheatley and Charlestown veins, Mr. Wheatley, the skilful superintendent of the mines established on these lodes, has discovered, and developed to some extent, a prolongation of the Wheatley vein, entitled the "Brookdale lode." That this is really but the extension of the first-named vein, is apparent from its lying precisely in its course, the line connecting them not deviating, in fact, the amount of half a degree in a distance from the north-eastern end of the Wheatley levels, or more than 3,000 feet to the engine-shaft on the back of the Brookdale portion. It is farthermore confirmed by the correspondence in the direction of the dip of the two veins, but especially by the close agreement, amounting to identity, between the vein-stones and ores of the respective lodes.

This remarkably regular silver lead vein, already one of the most extensive as respects its developed length in the country, has now been opened and is being mined at intervals along a range of about 3,072 feet. It is first approached, from near the water level, from the south-west side of Pickering creek by an adit cross-cut of 410 feet through the red shale ; the distance thence from this point, where the adit turns into the lode to the cross-cut leading from the vein to the main or engine-shaft, is 540 feet ; thence along the vein to the most western point now reached in the Wheatley mine, which is, in the ten fathom level, 571 feet, making a total length here wrought to this date, the 1st of May, 1853, of 1,111 feet. The main adit level, including the part in the red shale, is 1,279 feet long. Between the Wheatley and Brookdale engine shafts, the distance on the lode is 2,076 feet, and at the Brookdale mine the lode has been opened by an adit

level a farther length of 456 feet, making in all the developed length already specified of 3072 feet. That the lode is prolonged several hundred feet beyond the present termination of the adit of the Brookdale Mine, is evident to any careful observer; for the surface is marked in the vicinity of the course of the vein for this space, by chunks of cellular quartz, containing the well-known gossan of the vein, and even its distinctive ores and minerals, in quite significant clearness and abundance. It is certainly an encouraging feature in the vein that it thus so well preserves all its characteristics over so considerable a length. Although there intervenes a space of about 1501 feet between the southwest workings of the Wheatley mine and the northeast openings of the Brookdale, within which the lode has not yet been sought for nor proved, I conceive there can be no doubt that it maintains itself continuously through this interval, and is a regular persistent vein between the widest limits above mentioned.

In width, this vein varies from one foot to two or two and a half feet, its average size in the Wheatley mine being about eighteen inches, and in the Brookdale adit, nearly two feet. Thus far, it gives all the indications of being about as productive in ore in the latter mine at an equal depth as it is in the former. While the Brookdale end is somewhat thicker than the other, it is rather more full of quartz; yet the adit there, which is only some 30 feet below the surface, and is at present rather more than 456 feet long, presents, for 400 feet, what miners would call a "kindly lode for ore," with quartz, gossan, phosphate of lead, carbonate of lead, and galena; growing somewhat poorer, however, farther towards the southwestern end. The Brookdale shaft, descending on the lode, is down but 75 feet as yet, but the lode seems gradually to improve as the sinking advances.*

The dip of the lode in the Wheatley Mine is about two and a half feet to the fathom, or sixty-eight degrees; while it is steeper in the Brookdale end, being there about eighteen inches per fathom, or seventy-six degrees. Its mineralogical characters have been sufficiently described already, when presenting it as the type of the more promising lead-bearing lodes of this district; it may be well enough, however, in this place, to call attention to what has been said, under the head of "General Remarks," upon these veins, respecting the prevalence of a soft felspathic granite on its walls, a soft rich gossan in its upper levels containing silver, and the gradual reduction in the proportion of the phosphate and carbonate of lead, with a corresponding increase of that of the galena in descending from level to level in the Wheatley Mine.

* At this date, August 1, 1853, the shaft is down 110 feet; and a level, at 90 feet depth and 20 fathoms long, exhibits a much richer condition than the adit level above.

This last fact, showing a progressive replacement of the more easily vaporized ores—condensable only in the upper cooler parts of the vein—by other ores requiring a higher heat to sublime them, gives you, as already intimated in a former statement, a right to anticipate a somewhat farther augmentation in the quantity of galena as the mine descends. By indicating the energy of the igneous action which attended the injection of the metalliferous materials in the fissure, these more readily sublimated compounds are in themselves an assurance of the probable permanency and constancy in size, of the lode. That this vein is the product of true igneous or volcanic agency from a deep source within the earth, is not only clearly implied by all that has been here stated of its geological and mineralogical features, but is plainly demonstrated by the occurrence of pure volcanic or crystalline sulphur in the cavities of the less compact masses of the galena or sulphuret of lead. Were a conclusive proof of an igneous origin really needed, it would be furnished, I conceive, by this interesting fact. Other and equally striking evidences of the force with which the vein was injected will present themselves in the cross courses of trap-rock, intersected and displaced by the lode. To the description of these, I now proceed.

TRAP DYKES OF THE WHEATLEY LODE.

Throughout this mineral district, and, indeed, extensively over all this part of Pennsylvania, the strata are intersected by dykes or injections of all dimensions, chiefly narrow ones, of a fine-grained bluish trap-rock. These seem to observe one prevailing course, at least a general E. and W. direction of the principal ones has been detected by me. They traverse the oldest strata of the region, gneiss, and the ancient palæozoic limestone of the Chester County Valley, and equally the newest formation in the district, the middle secondary or red shale and sandstone. It is thus manifest, that some, at least, of these igneous injections are of a date subsequent to the deposition of the red sandstone, and it is highly probable that even many of those included within this tract of the oldest rocks, are of the same relatively recent age; yet we have in the Wheatley and Brookdale lode, which cuts no less than three of these small dykes of trap-rock, the interesting proofs that this lead-bearing vein, and, by analogy, the other metalliferous lodes, are of a date of origin even somewhat more modern. These would appear to be in fact the newest of the igneous injections of any sort encountered in all this Atlantic portion of the continent. Their precise geological age is not susceptible of any closer limitation than a date subsequent to that of the formation of the red sandstone, and prior to that of the cretaceous deposits which, in New Jersey, overlap this red

sandstone and its trap dykes unconformably, and which, from their embracing no mineral veins whatever, have very evidently been laid down after these I have now described were injected. They may possibly belong either to the epoch of disturbance which attended the elevation and close of the oolitic coal deposit of Virginia and North Carolina, or that other period, of a far greater and wider movement, which shifted the shores and interior basin of the continent, immediately before the vast cretaceous formation commenced its long term of sedimentary accumulation.

THE TRAP DYKES IN THE WHEATLEY LODE.

Dyke No. 1. From the engine-shaft cross-cut, south-west in the 10 fathom level 399 feet, there is a trap dyke (No. 1.) ending against the lode on its north-west side or foot wall; it is about 3½ feet thick, its course is east and west, and it dips north about 18 inches per fathom. Between this northern part of the dyke and its southern half, which abuts in like manner against the south-east side or hanging wall, there is a space of 56 feet; this has the same course, but its dip north is not more than 12 or 15 inches per fathom.

Dyke No. 2. There is another smaller dyke composed of close-grained trap; it also abuts against the lode on its north-west side about 93 feet from the south-west half of dyke No. 1, or 555 feet from the engine-shaft cross-cut. This dyke is about one foot thick; its course is about N. 70° W., and it dips almost perpendicularly. The other part of this dyke meets the lode on its south-east or opposite side, at a distance of 18 feet, presenting the same nearly vertical dip, and holding about the same thickness as its counterpart.

Dyke No. 3. Another dyke, three feet or more in thickness, occurs at a distance of thirty feet from the south-eastern half of dyke No. 2. As this lode has not yet been driven on this level beyond the dyke, or even entirely through it, it is not possible to state definitely its dimensions, or even its course and dip, though the latter appears to be north, like the other two dykes above described. It would seem to be heaved, but to what extent remains to be seen hereafter.

Adverting to the very different distances to which the two dykes, Nos. 1 and 2, are heaved in this level, viz., 56 feet and 18 feet, respectively, it is obvious that the displacement of these divided portions cannot be the result of an exclusively horizontal movement of the walls or cheeks of the fissure filled by the lode, but must be due, in part at least, to a vertical dislocation or shifting. The conditions of the case seem plainly to indicate that the throw of the north-west side of the fissure has been upward and forward towards the north-east, or that of the south-

east side downward and backward towards the south-west. The exact direction and amount of this oblique displacement of the walls of the lode cannot be computed from the limited data at present furnished by the mine; it seems, however, to have amounted to at least some three fathoms in a horizontal direction and to not less than twelve or fifteen fathoms in a vertical one. So heavy a dislocation or throw, when viewed in connection with the great length of the vein, is certainly a very encouraging feature, for it is plain that a crack, whose sides have been so much displaced, cannot pinch itself to very small dimensions, but must remain the same open well-defined fissure which we see it in the mine for a great depth beneath the present workings. Thus, the trap dykes, or cross courses, by disclosing to us an extensive displacement of the cheeks of the vein, confirm in an interesting manner the inferences already derivable from the lode itself, that, compared with the others of its district, it is an injection of mineral matter of more than ordinary regularity, extent, and richness.

PRESENT EXTENT AND CONDITION OF THE WHEATLEY MINE.

The Adit Level.—The adit or water level lies at an average depth beneath the surface of about 8 fathoms; its total length is 1279 feet; of this space, 410 feet are through red shale from the adit mouth to the lode. From this oblique cross-cut it is 540 feet along the lode to the short cross-cut at the engine shaft. Thence to the western whim shaft, it is 194 feet, and beyond this, the adit extends 135 feet farther.

The 10 Fathom Level.—This level has a total length at the present date, May 1, 1853, of 935 feet from the end of the engine shaft cross-cut to its present south-western terminus; it has now been driven 604 feet, and from the same point to its north-eastern end it is 331 feet long. It extends, therefore, about 275 feet past the south-western end of the adit level.

The 20 Fathom Level.—Up to the same date, the 1st of May, this level has been driven south-westward from the engine shaft cross-cut, 465 feet, and north-eastward from the same point about 95 feet, being a total length of 560 feet.

Of the Shafts and Winzes.—There are five external shafts and six shorter interior ones—called Winzes, by miners—connecting the different levels.

The Engine Shaft.—The main shaft of the mine, by which all the water is lifted, and a portion of the ore also, has a present depth of 217 feet;* it is perpendicular, and enters the gneiss rocks at a point 122 feet south-east from the lode at the surface. At the adit level, its distance from the lode, in consequence of this

* Now about 234 feet.

being nearly perpendicular in its upper portion, is still 120 feet; opposite the 10 fathom level its distance is 103 feet, and at the 20 fathom level the space is 76 feet. On the assumption that the present very regular rate of dip of the lode will continue, the shaft will be off from the 30 fathom level—not quite yet reached—about 51 feet, and 25 feet from the 40 fathom, and only 1 foot from the 50 fathom level, a little beneath which it will enter the lode. This shaft is in regular dipping gneissic strata, penetrated here and there with injections of granite and sienite.

The South-western Whim Shaft, 194 feet south-west from the engine shaft, descends in the lode, and has a depth of 174 feet.

The North-eastern Whim Shaft, 311 feet from the engine shaft, is not in the lode but in the gneiss rocks, and is so placed that it will cut the lode at the 20 fathom level. Its present depth is about 100 feet.

The Two Adit Shafts meet the lode at the adit level, and are only for ventilation; they both are to the north-east of the engine-shaft; the *first* at 201 feet from it, with a depth of 57 feet; the *second* at 530 feet from it, having a depth of 40 feet.

Of the Winzes within the mine there are two which descend from the adit level to the 10 fathom level, one of them situated to the north-east of the engine shaft cross-cut, and the other to the south-west of it.

The other four descend from the 10 fathom level to the 20 fathom level; and of these, one is north-east of the engineshaft cross-cut; one lies between this cross-cut and the western whim shaft, while the remaining two are to the south-west of this whim shaft.

PRODUCT OF THE MINE IN ORE.

I will now present some notes of the past productiveness of the mine, with my views of its prospective yield.

Good ore has been extracted in stoppings even between the surface and the adit level; for example, near the engine-shaft cross-cut, for a length of about 40 feet. In the next lift, or between the adit level and the 10 fathom level, the mine has yielded good ore in three several stoppings: one, north-east of the engine cross-cut, 40 feet long and 30 feet high; another, just south-west of the cross-cut, 80 feet long and nearly up to the adit level, or about 50 feet high; while the third or largest, was both north-east and south-west of the western whim shaft, and had a length of 214 feet and an average height of some 36 feet.

In addition to this portion already taken out, I would observe that there is a mass of ore still above the 10 fathom level, at its extreme western end, some 35 feet in length.

Note.—At date of printing, August 1, the 10 fathom level has been extended 72 feet and the 20 fathom level 168 feet.

Between the 10 fathom and the 20 fathom levels, there has been very little ore removed as yet, the chief piece of stopping being a little south-west of the engine shaft cross-cut. Another mass, about 50 feet long and only 9 feet high, has been taken chiefly from the south-west of the whim shaft; and there is yet a third stopping, on the main lode at the south-western end of the 20 fathom level, 45 feet in length, but carried up, at present, no more than some 12 feet on an average.

In the portions of the main lode which seems to promise a profitable future yield, there remains some ore above a long stopping near the western whim shaft above the 10 fathom level. The ground south-west of this old stopping is dead, and beyond it we find 36 feet of good stopping ground to the present end of the level.

From the 20 fathom level on the north-eastern end, northeast of the engine shaft, occurs a piece of good ground, almost 40 feet long, near the winze south-west of the engine shaft cross-cut; this first piece is 66 feet long between the cross-cut and winze. A second piece, beginning 50 feet northeast of the whim shaft, and extending for some 250 feet to the present end of this level, though in places quite lean, will pay well for stopping. At the south-western end of the workings, the lode appears of average richness. On the 10 fathom level there is a cross trap dyke 3 or 4 feet thick, and beyond this the vein is resumed, but is at present thin, being only just at the dyke. The 20 fathom level is not as far forward within 150 feet. It ends in a very fair lode, and has very recently increased both in size and richness, the ore part estimated to be two feet thick, and to yield three tons of ore per fathom.

BRANCHES FROM THE MAIN LODE IN THE WHEATLEY MINE.

An interesting and encouraging feature in this vein, betraying the energy and extent of the rupturing and injecting force, is the presence of several branch lodes which fork off at the acute angle from the main mass, and, for the most part, re-enter it again at a similar obliquity, insulating at the same level, at least, a thicker or thinner mass of the adjoining rock. These inclosed "Horses," as the miners call them, are sometimes entirely insulated in certain mines, sometimes only partially so. In the Wheatley lode, the principal one points off to nothing upwards, and feathers off in both directions horizontally, by the branch veins running into the main lode upwards as well as horizontally; but whether it is thus surrounded in the downward direction cannot be known, since it is growing progressively thicker from level to level descending. That this branch lode will eventually inclose the horse in the downward direction, seems altogether

probable, from its appearing to be so essentially a true branch shot upward and laterally from the main injection of ore.

The branch veins, as now developed, are :—

First. A branch vein or offset from the main lode, which turns out and re-enters it, insulating a horse. This branch at the 10 fathom level is 80 feet between its two junctions with the main lode, and at this level it recedes 9 feet at the thickest part of the horse. The horse contains strings of phosphate and carbonate of lead. This branch joins the main lode about 20 feet above, back of the 10 fathom level. It dips deeper than the main lode, underlying not more than 6 inches in a fathom; for, at 16 feet below the 10 fathom level the cross-cut to it is 12 feet long, and it will be 20 feet at the 20 fathom level.

This branch yields good ore throughout it, chiefly galena; its average thickness is about 9 inches, and it is richest where the horse is widest, and thin at its junction with the main lode.

Opposite this branch, the main lode contains galena and phosphate of lead as on the 10 fathom level, quite good ore, say about 18 inches in thickness.

There is another branch also on the north-west or underlying side of the lode, visible in the 10 fathom level, but opened and mined from the 20 fathom level. It has been mined 60 feet from the south-west point of the horse north-eastward to where the workings now are; but it has not been worked round into the lode.

This branch, like the other, is nearly perpendicular, underlying not more than 9 inches per fathom. The horse at the thickest is about 12 feet, and at the present end of the workings, 5 feet thick, the branch now approaching the main lode.

The horse is streaked with thin veins, and has chunks and strings of galena, carbonate of lead, &c. There are symptoms of other branches or turnouts of the vein, some of them on its south-eastern side; but these two, here mentioned, are the only ones now working.

These branches, it will be seen, promise to contribute quite a considerable auxiliary amount of ore to that derived from the main lode, and they deserve to be very carefully sought and pursued.

*　*　*　*　*　*　*　*

HENRY D. ROGERS,
Geologist.

ART. 7.—THE BLOW-PIPE, AND ITS USE IN CHEMICAL ANALYSIS.*

THE use of the blow-pipe in the chemical analysis of mineral substances has gradually, and through the exertions of Berzelius principally, become more and more general. It is, however, much to be regretted, that through the want, hitherto, of a few brief directions for its use, this simple and efficient instrument has not made its way into the hands of many who would find it of value in their experiments. The valuable treatises of Berzelius and Plattner are too detailed for beginners, and for many too costly. It is proposed in a brief and simple treatise to supply this want.

In the process of soldering, that is, of fastening two pieces of metal together by a metal coating, melted and then hardened upon them, the *solder*—which is more easily melted than the metals to be joined, a simple instrument called the *blow-pipe* has been used in different countries for centuries, the object of which is to melt the solder by means of increased heat. The simplest and most ancient form of blow-pipe is a hollow conical metal tube which is bent, without forming sharp corners, at right angles, at the smaller end. In using it the larger end is applied to the mouth, and a stream of air is blown in, which passes out at the opening in the other end, precisely like the wind from a bellows. The blow-pipe may, therefore, be regarded as a bellows on a small scale; and its heating or kindling power rests on precisely similar principles to those of the common bellows. In this its rudest form and application, the blow-pipe was of no utility in science. This it acquired through the skill and zeal of different men of science, by whom it has been elevated into an instrument of the highest utility for the chemist and mineralogist as well as for the miner and metallurgist. How these improvements were gradually brought about, a few historical details will show.

So far as is known, *Anton Swab*, a member of the Council of Mines of Sweden, who lived in the first half of the last century, was the first to use the blow-pipe in his experiments in the chemical analysis of ores and minerals. Next after him, was *Cronstedt*, the Swedish mineralogist, who made use of the blow-pipe in detecting and distinguishing minerals, in reference especially to the chemical system of minerals introduced (1758) by him. *Engeström*, who, in the year 1765, translated this system into English, add-

* Löthrohrbuch, Eine Anleitung zum Gebrauch des Löthrohrs, etc. Von Dr. Theodor Scheerer, Professor der Chemie &c., an der Bergakademie zu Freiberg. Manual of the Blow-pipe; a Guide to the use of the Blow-pipe. By Dr. Theodore Scheerer, Professor of Chemistry in the School of Mines at Freiberg, Brunswick, 1851.

ed a description of Cronstedt's mode of applying the blow-pipe.* In 1773, this description was translated into Swedish, and afterwards into several other European languages. Imperfect as the application of the blow-pipe then was, the certainty and celerity of the results attained by it, attracted great attention even then. But the new art made slow progress, for, easy as it seemed it required constant practice. Its application was considerably extended by *Bergmann*, who made use of the blow-pipe in *qualitative* analysis in the whole field of inorganic chemistry, and showed how very small quantities of mineral substance could be discovered by means of it, the detection of which in any other way would be far more difficult. Bergmann announced his experiments in a paper which was published at Vienna, in Latin,† in 1779, and in 1781 was translated into Swedish by Hjelm. It was *Gahn*, who, after Bergmann's death, advanced still farther on the path he opened. By constant and zealous effort he acquired great skill in the use of the blow-pipe; but as he took no note of his valuable experiments, they would have been almost entirely lost, had it not been for his enlightened and liberal readiness to communicate his art to others. It was thus the younger *Berzelius*, whom *Gahn* distinguished as his favorite pupil, was enabled to profit by his experiments and build on his foundation. Gahn had judged with sagacity. One better adapted to this work, he could hardly have found. By the latter, not only was the application of the blow-pipe greatly perfected and extended, but through his teachings and writings it became so general, that it is now an essential part of the education of every chemist and mineralogist. In 1821, *Berzelius* published his excellent work, "Use of the Blow-Pipe in Chemistry and Mineralogy," many editions of which have been published.

Chemical investigations with the aid of the blow-pipe had been hitherto confined to *qualitative* analysis. *Harkort* first conceived the fruitful idea of using the blow-pipe in *quantitative* analysis, and thus laid the foundation of a new branch of chemical art, the art of *quantitative* blow-pipe analysis. In 1827 appeared the first result of his experiments, at Freiberg, the first part of his "Art of Analysis with the Blow-pipe" containing the analysis of silver. The publication of the second part, containing the analysis of lead, copper, and tin, was prevented by a call to Mexico, where he died a few years after. *Plattner* recognized the importance of this new application, and for many years devoted himself to the practical development of Har-

*An Essay towards a system of Mineralogy, by Cronstedt, translated from the Swedish, by Von Engerström; revised and corrected by Mendes a Costa, Lond. 1770.

**T. Bergmann, comment de tubo ferruminatorio ejusdemque usu, in explorandis corporibus, præsertim mineralibus, Vindobonæ,* 1779.

kort's idea. His perseverance and skill carried the art of blow-pipe analysis to a point of perfection which had not previously been thought possible. *Plattner* published the result of his investigations both in qualitative and quantitative analysis in his work, "Analysis with the Blow-pipe," the first edition of which appeared in 1835, the second in 1847.*

The subject of qualitative and quantitative analysis with the blow-pipe in the present stage of development to which Berzelius and Plattner have brought it, is so comprehensive, that it requires considerable time and practice to become familiar with it. This is particularly the case with the quantitative analysis, which is seldom mastered by chemists. It is proposed now to give a brief view of the art of qualitative analysis with the blow-pipe, which is susceptible of very wide application, and a statement as summary as possible of the most important points of the subject, so that beginners, and the inexperienced, may be guided in their labors, and derive real advantage from that true friend of the chemist, the blow-pipe.

I.

THE BLOW-PIPE FLAME, AND THE INSTRUMENTS NECESSARY IN QUALITATIVE BLOW-PIPE ANALYSIS. †

The blow-pipe flame is produced by causing a stream of air, in accordance with certain rules, to pass through the flame of a candle or lamp, by means of the blow-pipe. The flame of an oil lamp, with a broad wick, but not too thin, and arranged in a manner which will be hereafter described, is best suited to this purpose. The chief requisites for producing a good blow-pipe flame, are: 1, the steadiness and duration of the stream of air; and, 2, the right application and direction of the flame. The first point will be considered when the blow-pipe is described. As to the second, the chemical effect of the flame, upon the body heated by it, may be made at pleasure, either oxidating or reducing. ‡

The OXIDATING flame and the REDUCING flame are the chief agencies in all blow-pipe analyses. The chemist who can

* Plattner's work has been translated into English by Dr. Muspratt.—TR.

† The distinction between qualitative and quantitative analyses is well given in the following classification of chemical analyses, which we translate from an excellent little German essay on the Blow-pipe, by Július Krüger, of Berlin; *Leitfaden u qualitativen untersuchungen mittelst des Luthrohres.* "In the investigation into the component parts of a body, we may distinguish three modes. 1st. The examination into the substances of which a given mixture or compound consists, is *qualitative analysis.* 2d. The examination and determination of the component parts, and relative proportion of the parts of a given body, is *quantitative analysis.* 3d. The quantitative determination of the elementary substance of which a given body consists, is *elementary analysis.*"—TRANS.

‡ Termed also deoxidating.—TR.

produce these flames of the right kind, and of requisite duration, has mastered one of the most difficult points of the art.

A *reducing* flame is produced in the following manner. The end *b* (Fig. 1) of the blow-pipe (the other parts of which are

FIG. 1.

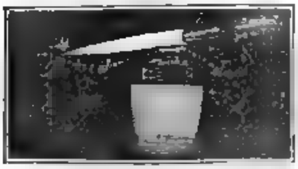
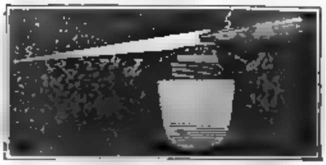


FIG. 2.



omitted in the cut) is held parallel with the wick *dd*, which is cut somewhat obliquely, and it is held in such a way that the point hardly touches the thin side of the flame. The effect will be a *yellow shining* flame of about the form represented in figure 1.

An *oxidating* flame (Fig. 2) is produced by introducing the end of the blow-pipe *b* to the distance of a third of the breadth of the wick *dd* into the flame. At the same time it is advisable to blow a little harder than for a reducing flame. The oxidating flame is *blue* and *faintly shining*.

The yellow color and shining appearance of the reducing flame are owing to the particles of carbon which float in the burning gases, heated but not burnt, until they reach the outside of the shining ball of flame and are consumed. In the oxidating flame, which is distinguished by the blue color of the burning carbonic acid gas, these particles of carbon are not present.

The cause of this difference between these flames is quite obvious. In the reducing flame, the stream of air, which is quite weak, drives the entire flame before it, but the air streaming in is not perfectly mingled with the gases of the flame; while in the oxidating flame a stronger draft of air is poured directly into the flame, and becomes more perfectly mixed with its gases. In this case, therefore, a far more perfect combustion is necessarily produced.

If a small piece of any substance capable of oxidation is placed before the point of the oxidating flame, it will be heated, and oxidated by the surrounding atmospheric air. If now a stream of air is strongly driven through it, a portion of air unconsumed will pass through the flame, and heighten the oxidating effect. The oxidating flame is used not only in oxidizing, but also, on account of the greater intensity of its heat, in heating bodies, in order to determine their capacity for being melted. In such cases it is to be observed that the point *s* is the hottest part of the flame.

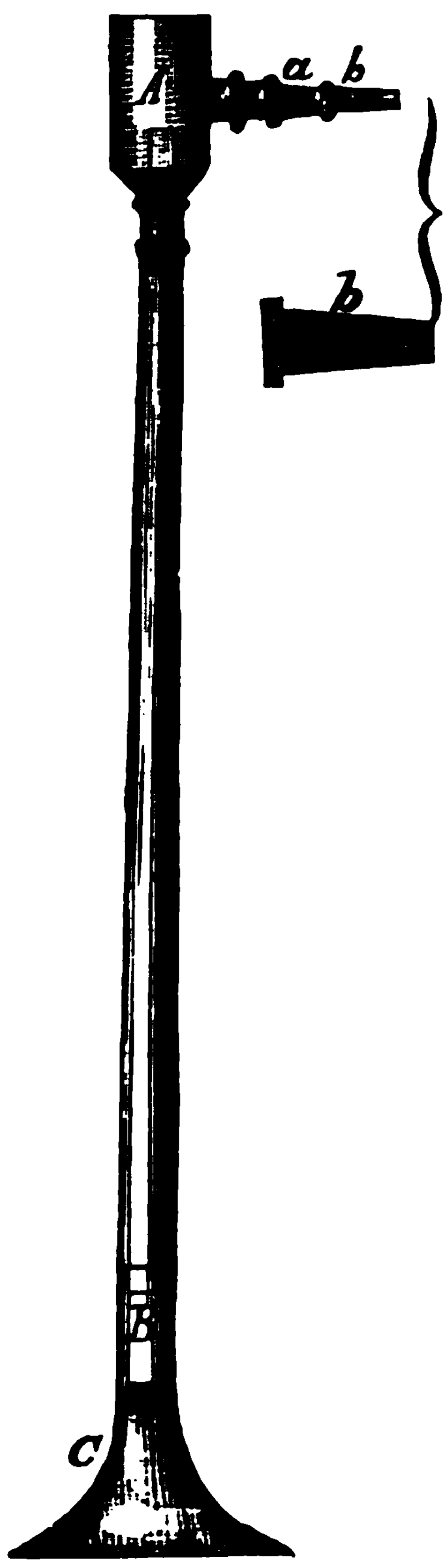
The reducing flame is most effective when the body under

examination is held so far in it that it is as completely as possible surrounded by the flame, and thus protected from the influence of the atmospheric air. But care must be taken not to put the substance too far into the flame, otherwise it will become covered with rust, which interferes with the heating, and is attended with other disadvantages.

A, THE BLOW-PIPE.

The blow-pipe, in the form in which it is now most commonly used, is represented at about one half its real size in figure 3. It is usually made of brass, tin or silver, excepting the mouthpiece C, which is made of horn. Many blow-pipes are without this mouthpiece, and then they have at B a silver rim. A is the air chamber; in which the air blown from B through the tube A B is collected, and forced out through the side pipe *a*, and the point *o*. The tube A B, the air chamber A, the side pipe *a*, and the point of the blow-pipe *b*, are separate pieces, which are fitted and held tightly together by friction. The point of the blow-pipe is made most advantageously of platina, and the arrangement of it is shown on a large scale in the sectional view *b*. The mouthpiece C, formed precisely like the mouthpiece of a common trumpet, is held, in blowing, *against* the lips. If there is no mouthpiece, the lips in blowing must *inclose* the tube. The former arrangement requires far less exertion; with the mouthpiece C the operator can, with proper practice, blow without cessation for five or ten minutes. During this continuous blowing, air is inhaled through the nose, the palate is used as a valve, and the air forced out by working the muscles of the cheeks.

FIG. 3.

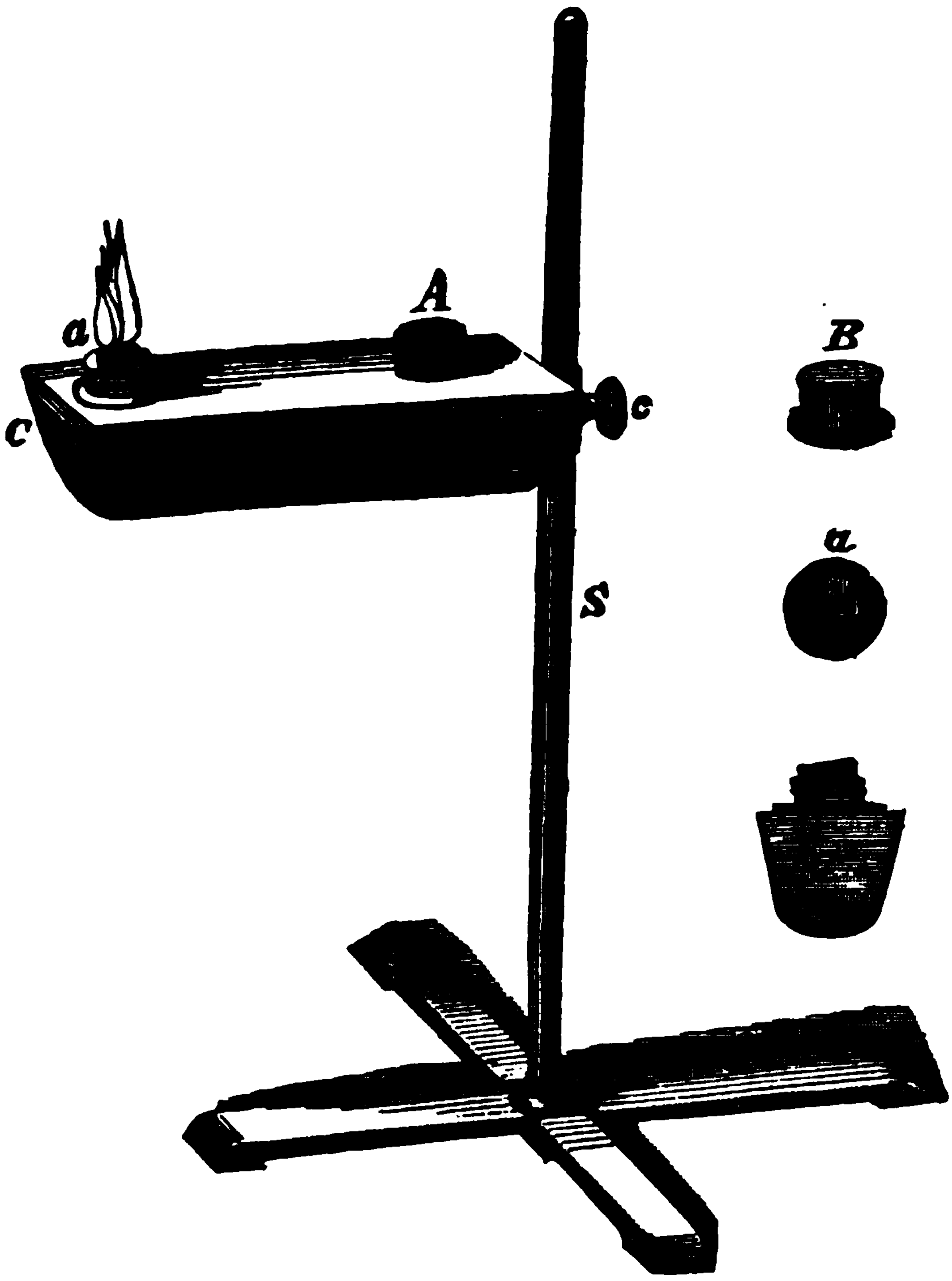


B, THE BLOW-PIPE LAMP.

Is arranged in the manner shown in figure 4, of about one-third of the real size. The bowl of the lamp K is made of sheet iron covered with tin, or of brass, lackered black on the outside; by means of the screw *c*, it may be moved up and down the perpendicular rod S, and is filled with oil at the hole A, which is closed by a screwed cover; and *a* is the tube or socket with the wick. Around the socket and open-

ing for the flame, as well as at A, is a thread for a screw, to be used in extinguishing the flame, and securely shutting off the oil.

FIG. 4.



The arrangement of the socket for the flame is more minutely shown by the plan *a*, and the front view C', (seen from C in the principal figure.) The chamber K, in using the lamp, is screwed up to a point which will afford the arm resting on the table, and by which the blow-pipe is held, a convenient position. Refined turnip oil is to be recommended for this lamp in preference to all others. It affords a strong heat and very pure flame. The blow-pipe flame obtained from a common wax-candle is much inferior in size to that of a lamp.

C, THE BED AND SUPPORTS, OR HOLDERS, OF THE SUBSTANCE TO BE HEATED.

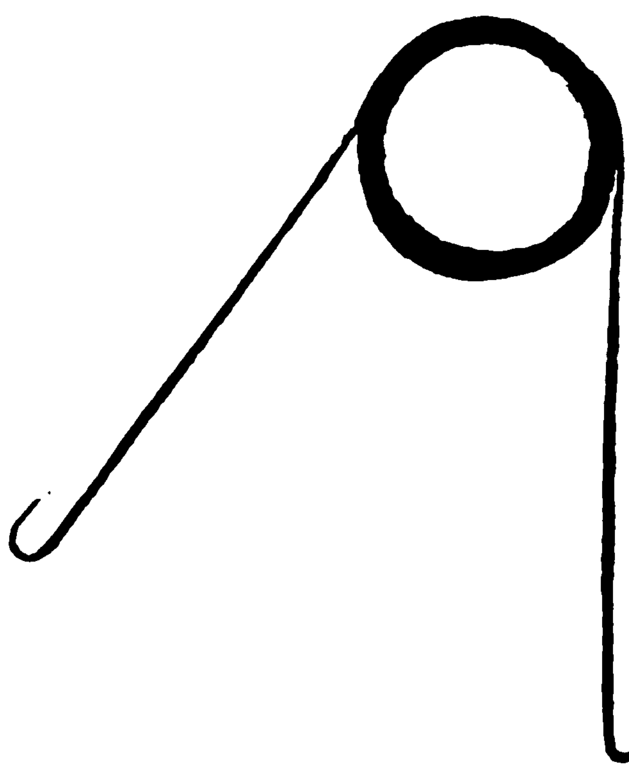
For holding the body which is to be subjected to the blow-pipe flame, steadily, a fire-proof bed or fire-proof holder must, of course, be used. The chief articles used are the following:

1. *Charcoal.* A perfectly charred thick and dry piece of pine charcoal, without knots, with the rings of annual growth lying

as close together as possible, the quality of which may be ascertained by its clear sound, when struck, must be sawed into six-sided parallelopipeds six inches long and two inches wide, in such a way that the rings of the two long sides (2 inches wide) shall be cut as nearly as possible at right angles. It is the long sides which are made use of. The body to be heated is placed in a shallow cavity made near the edge of the coal. The other two long sides, which run parallel to the rings or rather to tangents of them, are not fit for use, because, owing to their irregularity, they burn unevenly, and split off. A substance is heated upon charcoal when a reduction is to be effected and oxidation prevented, or when the reducing effect which unavoidably accompanies contact with the coal, is of no disadvantage to the investigation.

2. *Platinum wire*, of about the thickness of 0.4 *millimetre.** A long piece is wound round many times in a circle in the manner shown in Fig. 5., and provided with two bent hooks at the ends left free. The forefinger of the left hand is passed through the ring, and one hook containing the substances to be used as reagents is exposed to the blow-pipe flame. Borax and the double phosphate of soda† (of which we shall more particularly speak hereafter) are generally used, and they melt into transparent beads, into which a particle or grain of the substance to be examined is placed, in order to test its behavior towards given fluxes, both in the oxidating and reducing flames. But care must be taken, of course, that no substances be subjected to such an analysis, which under such circumstances have a disturbing effect on the platinum wire.

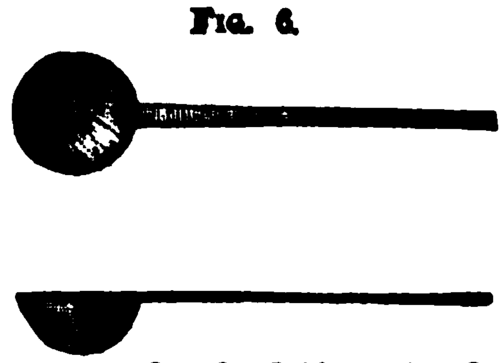
Fig. 5.



3. *Platinum foil* is used in heating, especially melting, substances that are not to be exposed to reduction, which is unavoidable on charcoal. The platinum foil (about two inches long and one inch wide) is either placed upon a piece of charcoal or held by a pair of pincers.

4. *A Platinum spoon* of the size and form shown in Fig. 6. The stem is fastened into a handle provided with a screw for holding it firmly, or into a cork. A spoon of this kind is used in melting certain substances with sulphate of potash or saltpetre.

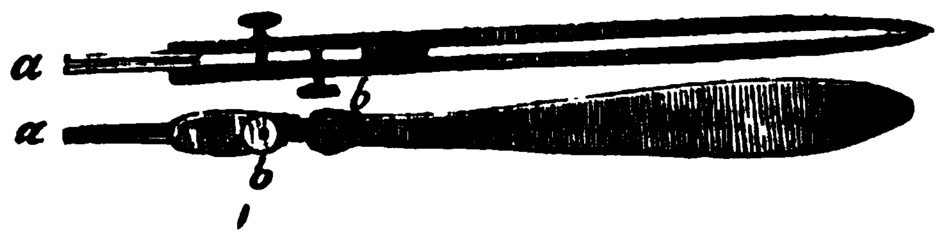
Fig. 6.



* A *millimetre* is ·03937 of an inch. † Called also microcosmic salt.—Trans.

5. *A forceps with platinum points* is so contrived (as is seen in Fig. 7) that the two platinum points open when the buttons *bb* are pressed. Between the extreme ends of the platinum points, a small piece or splinter of the substance is introduced; and the object of the examination is to ascertain its fusibility, or the color it presents when heated in the blue blow-pipe flame. The entire length of the forceps is 5 to 6 inches.

FIG. 7.



6. *Glass tubes*, about 6 *millimetres* in diameter, and cut into pieces 5 or 6 inches long. They are of special use in roasting substances containing sulphates, selenites, arsenites, antimoniurets and tellurets, which when heated in the tube, according to certain rules, either coat the sides of it in various ways, or are detected by the peculiar odor emitted.

7. *Glass receivers*, which can easily be provided by sealing or fusing together one end of a glass tube. They are made 2½ to 3 inches long, and are used in heating substances containing volatile matter, where little access of air is desirable. The volatile matter coats the sides of the vessel, but is not oxidated as when heated in a glass tube.

[TO BE CONTINUED.]

JOURNAL OF MINING LAWS AND REGULATIONS.

A Legal Investigation of the Nature of a Mineral Substance.

A CASE of very considerable scientific, as well as mining and commercial interest, has recently occupied the Jury Court (first division) in Scotland, before the LORD PRESIDENT and a special jury, for six successive days, terminating on the 4th August ultimo.

STATEMENT OF THE CASE.

ELIZABETH HONYMAN GILLESPIE, heiress of entail in possession of the Torbane Hill Estate in Linlithgowshire, and WILLIAM GILLESPIE, her husband, were the plaintiffs, and JAMES RUSSELL and JAMES RUSSELL the younger, coalmasters near Falkirk, and as individual partners of a company, the defendants. Divested of the peculiar phraseology of the Scottish law, the facts appear to have been that, by a contract for a lease entered into in March and April, 1850, it was agreed that the plaintiffs should grant to the defendants a lease of "*the whole coal, ironstone, iron ore, limestone, and fire-clay*, but not to comprehend copper or any other mineral whatsoever, except those herein specified, in the lands of Torbane Hill, within certain boundaries therein particularly described, for a period of twenty-five years from Candlemas, 1850, at certain lordships, or royalties for the first year, and £300 a-year or the lordships, at the option of the proprietors for every year after. It was further provided that the defendants should be at the entire expense of boring, sinking, and other operations, and to assist them in so doing, that the first year of the lease should be allowed without payment of any fixed rent—they merely paying a royalty on the produce raised; and that should coal or ironstone be found at or before the expiry of the

first year, capable of being wrought to profit, a formal lease should be entered into, according to the heads of the agreement, with all usual necessary clauses. The defendants entered, and are still in possession; but no formal lease has ever been executed. The plaintiffs alleged, that although in the course of their operations, they (defendants) had come upon iron ore and stone, coal, and fire-clay of workable value, they had, without the authority of the plaintiffs, confined their operations chiefly or exclusively to the working and disposing of a valuable mineral substance of an argillaceous bituminous nature, which had not been let to them, and which, it is alleged, was not comprehended in the agreement, and to which the defendants had no right or title whatever. It appeared that the defendants had, prior to the date of the action, raised to the extent of about 19,000 tons of the mineral substance in dispute, calculated at 22½ cwts. to the ton, and had disposed of it, as the plaintiffs alleged, under the erroneous or false name of *gas coal.* That substance is of much greater value than any of the minerals specified in the agreement for the lease, and fetches in the market a price greatly higher than any description of coal. The plaintiffs further alleged that the substance in question could not be classed or dealt with as coal, or as any one of the mineral substances comprised in the agreement; that in its chemical and mineralogical constitution and qualities it was quite different from coal; that no such substance was, when the agreement was entered into, known or dealt with in the market, or otherwise, &c., &c.

The defendants, on the other hand, alleged that the terms of the agreement comprised the subject in question, and that they had entered into the agreement in question in the hope of discovering on the lands a particular description of coal, which existed on the adjoining lands of Boghead, believing that the mineral strata was the same; and that if this substance was not coal, there was no coal on the estates or comprised in the letting, for which they had contracted to pay a heavy rent. The defendants had previously to the agreement worked the Boghead coal, which was well known in the market; it was a coal which contained a large quantity of inflammable matter, capable of being disposed of to gas-works. It was termed gas coal, Cannel coal, and Parrot coal—its more particular description in the locality and in the market being the Boghead gas coal; and they alleged that they entered into the lease expecting to find the same coal in the lands of Torbane Hill.

OPINIONS OF GEOLOGISTS AND CHEMISTS FOR PLAINTIFF.

The main question between the parties, however, was whether the substance in question was or was not coal. On the part of the plaintiffs, Profs. ANSTED, ANDERSON, Mr. BLANDE, the celebrated chemist, Mr. ALEXANDER ROSE, the Rev. D. ANDERSON, Dr. GEORGE WILSON, and Dr. J. T. COOPER, were severally examined. Mr. BLANDE produced an analysis he had made of the mineral, from which it appeared that 100 parts of it contained only 10 of carbon, 26 of ash, and 70 of volatile matter, principally carburetted hydrogen. The result of his analysis satisfied him that it was not coal. The effect of the evidence of the other eminent chemists and mineralogists seemed to be that it was not coal, but a new mineral, hitherto unknown—a species of bituminous shale. That a substance containing less than 70 or 68 per cent. of carbon could not be considered as coal; that it was rather a kind of bituminous clay. It was lower in specific gravity than coal, and lower in the scale of hardness. It was less brittle than coal; its streak was brown instead of black; it was slightly translucent, while coal was opaque. It was a clay largely impregnated with bitumen, but had no property in common with coal, except that gas might be produced from it. The Torbane mineral left no available coke, and no substance could be called coal unless it gave a considerable residuum of coke. On cross-examination it was, however, admitted that some substances which went to compose coal might be found in the Torbane mineral, though in different degrees and arrangements. Further scientific witnesses were then examined as to the appearance of the mineral under the microscope; and they gave their

opinion that it was different in organic structure from coal, and presented no traces of vegetable origin. Operative coal miners and coal managers were then examined. The former had worked in the Torbane pits and in coal mines; and they stated that the mineral when struck produced a deaf and not a clear sound like coal; that it emitted a smell of gas so strong as to produce headaches, or to make them vomit, which they had never experienced when working coal, and that it was very difficult to work compared to coal; and the latter, as practical men, gave their opinion that the mineral was not coal. Scientific and practical evidence was further given that the mineral yielded gas of a highly illuminating power and in large quantity—14000 cubic feet of gas to the ton; whilst the best Cannel (the Wigan Cannel) only produced 11,500; that it yielded much more tar than any coal, and much less ammonia; and that although not coal, it had been probably so called from also producing gas, which it produced of high quality.

OPINIONS OF GEOLOGISTS AND CHEMISTS FOR DEFENDANTS.

On the part of the defendants, Prof. JOHNSON, of Durham, Prof. RAMSAY, of London, Prof. HOFFMAN, Chemist in the Government School of Mines, Prof. FYFE, Dr. DOUGLAS MACLAGAN, Dr. GREGORY, Prof. FRANKLAND, Mr. DICKINSON, Government Inspector of Coal Mines in England, and a number of other scientific, practical, and operative witnesses were examined. The result of their evidence was, that it was a coal of the Cannel or Parrot kind, differing in no essential respect from that sort of coal, but agreeing geologically and chemically with it in all its characteristics—that its component parts were similar to those which composed coal, its ash contained the same ingredients, and its combustion agreed in character. Professor HOFFMAN, who had been a pupil, and for some time assistant of LIEBIG, had subjected it to the usual solvents and tests, to ascertain that it was a mixture of bituminous matter, and he only discovered the merest trace of bitumen, and it was not reduced to a fluid state, as would have been the case if it was bitumen. The ingredients of coal varied considerably, but carbon was the largest; and from 100 parts of this substance he extracted 65.66 of carbon. There was nearly nine per cent. of hydrogen, but he did not consider this incompatible with this mineral being coal; he did not believe there was bitumen in this body, but it might have produced it. Coal shales generally contained 60 per cent. of earthy matter; this mineral could not be called shale, or schist, its predominant constituents not being earthy matter, as in shale, but carbonaceous; he considered it a true coal. Dr. FYFE stated that he had analyzed all the Cannel coals in Scotland, in order to ascertain their gas-producing qualities; and he had also analyzed the disputed mineral, and it in no respect differed from the ordinary Cannel coals except in being of a very superior quality. Comparing its constituents with Capeldrae Cannel coal, he found them to be as follows:—

TORBANE HILL MINERAL.		CAPELDRAE CANNEL.	
Carbon,	60 25	Carbon,	56 7
Hydrogen,	8 8	Hydrogen,	6 8
Oxygen,	3 6	Oxygen,	8 9
Nitrogen,	1 5	Nitrogen,	1 8
Sulphur,	3	Sulphur,	25
Ash,	25 6	Ash,	25 4

The only difference between the two was that this was a better gas coal than the other. The further scientific evidence went to establish that this mineral burnt exactly like a Cannel coal—that, when heated in a retort, its products were exactly like those of a Cannel, and that this was a Cannel coal.

Dr. DOUGLAS MACLAGAN exposed this substance to the action of naphtha, which made substances containing bitumen yield it; he found only an infinitesimal quantity—mere traces of it. Shale was a mineral with a larger quantity of earthy matter than coal, but that there was no line of demarcation between

them; that they ran into each other; that the earthy matter in this substance was incompatible with its being a shale. Carbonaceous matter was the base of this mineral, and not clay. Professor FRANKLAND could discover no bitumen in it, but its gas-producing powers were much greater than those of bituminous coal.

Evidence was then given as to its stratification; it was found among the ordinary coal strata, and a number of coal-mining engineers proved that it was Parrot coal. Several scientific witnesses of the highest repute were then examined upon the stucture of the mineral as exhibited by the microscope, and as compared with Cannels. Its structure was vegetable, characteristic of the fossil plants of the coal formation. There were three structures in coal—the woody fibre, the scalariform, and the cellular tissue, all of which were found in this mineral, while shales did not exhibit any traces of vegetable structure.

Officers of a Glasgow gas company proved that they paid 15s. per ton for this, and only 6s. 1½d. for other coal.

Further evidenee was given to displace the allegations of concealment or unfair dealing, by showing that this mineral had been found by boring so far back as 1837; that Mr. GILLESPIE knew before entering into the agreement that it was a gas-producing coal; that he had previously applied to others to work it, and had solicited the defendants to raise it for the purpose of producing gas.

CHARGE OF THE JUDGE.

After the jury had been addressed by most eminent counsel on both sides, the LORD PRESIDENT summed up. The jury were to determine whether the substance in question fell within the term whole coal in the demise, for it was not pretended that it came within the terms specified in it. On the one side there were four geologists, who gave it as their opinion that it was not coal, and five on the other side who said it was coal, all speaking with perfect sincerity, according to what they, as geologists, classed as coal. Men of the highest reputation in geology and chemistry had been examined, but they differed very much in opinion. On one side there were five of the most eminent chemists, who had applied all their skill and energy to find out whether it was coal or not, and who had expressed themselves as clearly of opinion that it was not coal, while ten, equally eminent on the other side, were of a diametrically opposite opinion. Is this substance, then, a coal or not, in the ordinary language of those who deal in it, and of the country? Because, to find a scientific definition of coal after what has been brought to light for the last five days, would be, he said, indeed a difficult thing.

VERDICT OF THE JURY.

The jury, after retiring for five minutes, returned with a verdict for the defendants, thus establishing that, in their opinion, the substance in question was, in effect, coal, and removing altogether from the company the slightest imputation of concealment or deceit.

REMARKS.

We have carefully condensed the material evidence from a very extended report, in order to present to our readers a clear and intelligible view of this very remarkable case, and to direct attention to the substance, the subject of it. Although we have been ourselves long aware of the distinctive characteristics of this peculiar substance, it having been as yet found in only mineral districts, many of our readers are possibly unacquainted with it. It probably exists in other districts, where it may, perhaps, be unnoticed or considered as shale, and of course comparatively valueless. Any person who has witnessed the lighting of the New Houses of Parliament, in which Cannel coal gas is only employed, will be struck with its superior brilliancy and illuminating power, and notwithstanding somewhat higher cost, it is beginning to be introduced very generally into the mansions at the west end of the metropolis. It is impossible to dissent from the conclusion to which the jury came, that this substance is coal; and

it may be fairly inferred that the gas, which it produces in such large quantities, is at least equal, if not superior, to that produced by the best Cannel coal.

Expense seems not to have beed spared on either side in procuring the most eminent witnesses; and we cannot avoid being sensibly struck by the singular conflict of opinion between them. That conflict was not confined to speculations on the simple question whether the substance was or was not coal; but it pervaded every detail and every analysis. It is difficult to reconcile experiments which on the one hand produced only ten parts of carbon out of every hundred parts of this mineral, and on the other hand produced upwards of sixty parts of carbon out of the same quantity of the same substance. While witnesses on the one side proved that it was largely impregnated with bitumen, those on the other demonstrated that there were scarcely any traces of bitumen to be found in it. Neither can we avoid apprehending that such startling contradictions, unless explained and reconciled by the learned and profound dissentients, must tend to shake public confidence in the present state of chemical knowledge, and to some extent diminish our reliance on the dogmas propounded by scientific experimentalists in the laboratory.—*London Mining Journal.*

DECISION OF THE SUPREME COURT OF CALIFORNIA ON THE PROPRIETORSHIP OF THE MINES.

We recommend to our readers the perusal of the following decision of the Supreme Court of California, Judges Heydenfeldt and Wells. It will be seen that the opinion of the Court is to the effect that the mines of gold and silver in California are the property of the State, and not of the Federal Government:—

HICKS *et al.* *vs.* BELL *et al.* The objection that the record discloses, that there was no actual possession, it appears is not good, because there was actual possession of a portion adjacent to the premises in dispute, and as I understand it, constructive possession of the latter was claimed by the rules and customs of miners on that part of the river. Nor can it be here determined that the jury were not properly informed as to what were those rules. The bill of exceptions does not pretend to set out all that occurred on the trial, but only such incidents as were the subjects of dispute and exception.

The jurisdiction of the District Court is conferred and defined by the constitution, and no statute can deprive it of its powers. Although the jurisdiction of mining claims is given by law to Justices of the Peace, that of the District Court remains unaffected, if the amount in controversy exceeds two hundred dollars.

The main reliance in this case of the appellants is, that the land in question is the public land of the United States, and therefore the statutes of this State, which recognize the possessions of miners, which provide for their protection, and require mining claims to be decided according to the rules and regulations of bodies of miners, at each particular mining locality, are mere police regulations, and are invalid to confer any right, such as that of possession, or to enable the recovery thereof.

This position involves the decision of the question, "to whom do the mines of gold and silver belong?" To arrive at a satisfactory solution it is only necessary to examine a few of the leading authorities. According to the common law of England mines of silver and gold are termed Royal mines, and are the exclusive property of the crown.

Blackstone says—vol. 1, p. 294—A twelfth branch of the royal revenue, the right to mines has its original from the king's prerogative of coinage, in order to supply him with materials, and therefore those mines which are properly royal, and to which the king is entitled when found, are only those of silver and gold. By the old common law, if gold or silver be found in mines of base metal, according to the opinion of some, the whole was a royal mine and belonged to the king, and he cites 2 Inst. 577.

In the case of The Queen and the Earl of Northumberland, cited from Plow-

den, it was decided that although the king grant lands and the mines which are in them, yet royal mines will not pass by so general a description.

It was farther explicitly decided in the same case, that all mines of gold and silver within the realm, though in the lands of subjects, belong to the crown, and this right is accompanied with full liberty to dig, and carry away the ores, and with all such incidents thereto, as are necessary to be used for getting them.

This case has never been overruled, and stands as the accepted exposition of the common law. For although Lord Hardwicke in the case of Lyddal *vs.* Weston, 2 Atk. 20, seems to confine the royal right of entry to cases where the mine had already been opened, yet he does not question the royal ownership, and seems finally to decide the case upon a different reason. Even, however, his slight departure from the doctrine of the case in Plowden was subsequently disapproved, and doubted as authority by Sir Wm. Grant, Master of the Rolls, in the case of Seaman *vs.* Vaudrey, 16 Vesey, 393.

The rules, therefore, as laid down in the case from Plowden, may be considered as uncontradicted, and has the solemn sanction of being the concurrent decision of all twelve of the judges.

Blackstone, it will be seen, attributes the origin of the law to the right of coinage. Plowden says that the reason is, because gold and silver are most excellent things, and the law has appointed them to the person who is most excellent, and that was the King. It is, however, immaterial as to the reason for its origin, the law has been settled beyond question, as it is declared by the earliest and most distinguished judges, and to this time has never been disputed.

See Bainbridge on the law of mines and minerals, where the authorities are collated.

This doctrine of the law has been acted upon in some, and probably many of the States of the Union. In Pennsylvania it was the subject of legislation as early as 1781. In that year, by an act establishing a land office, she reserves for the use of the commonwealth one-fifth of all gold and silver ore. (See Dunlop's Laws of Penn.) In New-York, as early as 1789, an act of the Legislature was passed exempting the discoverers of gold and silver mines from paying to the people of the State as sovereign thereof, any portion, or dividend of the yield for the space of twenty-one years, from the time of giving notice of the discovery, and forbidding the working of the same after the expiration of that term.

See 1 Laws of New-York, 124.

Again in 1821, another act was passed which declares, that all mines of gold and silver discovered, or hereafter to be be discovered within this State, shall be the property of the people of this State in their right of sovereignty.

See 1 Revised Stat. 281.

This was in effect but a re-enactment of the common law, which vested the right in the State Government as the successor of the King.

It is hardly necessary at this period of our history to make an argument to prove, that the several States of the Union, in virtue of their respective sovereignties, are entitled to the jura regalia which pertained to the King at common law. An analogous question to the one under consideration, was fully discussed in the Supreme Court of the United States in the case of Pollard's Lessee *vs.* Hogan, 3 How. It was there held, in the case of a new State, that she was admitted into the Union upon the same footing as the original States, and possessed the right of eminent domain. Numerous other cases can be cited in which the decisions are uniform, that the United States has no municipal sovereignity within the limits of the States.

In reference to the ownership of the public lands, the United States only occupies the position of any private proprietor, with the exception of an express exemption from State taxation. The mines of gold and silver in the public

lands are as much the property of this State by virtue of her sovereignty, as are similar mines in the lands of private citizens. She has therefore solely the right to authorize them to be worked, to pass laws for their regulation, to license miners, and to affix such terms and conditions as she may deem proper to the freedom of their use. In her legislation upon this subject, she has established the policy of permitting all who desire it, to work her mines of gold and silver with or without conditions, and she has wisely provided that their conflicting claims shall be adjudicated by the rules and customs which may be established by bodies of them working in the same vicinity. According to this enactment, the case under consideration has been tried and decided, and for aught that is disclosed by the record, the decision is consonant with right and justice.

Judgment affirmed. HEYDENFELDT, J.

Concurred in. WELLS, J.

COMMERCIAL ASPECT OF THE MINING INTEREST.

Since our last number there have been very few transactions in mining stocks, and those at a decline. In the North Carolina mining stocks there has been a falling off, except in Phœnix gold, which is firm at from 1¼ to 1⅝. The developments made in this mine are so far exceedingly encouraging. From a recent report it appears the company own in fee 700 acres of land, on which there are several rich veins of copper, particularly the Orchard vein. And they have, also, a great amount of rich gold tailings which, upon a recent experiment made here with a crusher and amalgamator, yielded $40 to eight bushels of tailing.

The accounts from the Lake Superior Silver Company on Lake Superior are also of great promise, and if the ore continues to yield any thing like the quantity sent down here it must produce as surprising results as any thing in this market. The news from the mines generally on Lake Superior is good. We are glad to observe that the remarks in our last number met with such favor as to be copied into those very respectable papers, the *Evening Post* and *Courier & Enquirer*. Generally speaking, most of the mining companies now in existence are using every exertion to develope their mines. No new companies, so far as we can learn, have been brought out since our last. What the public want, is results. Let one or two of the new mines commence paying dividends fairly and honestly earned, and it will speak more for them, and mining matters generally, than all the prospectuses and promises that could possibly be made. We note that by the last accounts from Europe, the price of copper was again advancing. Should this continue during the coming year, so as to allow many companies, particularly those on Lake Superior, which are on the eve of making dividends, to profit thereby, it will have considerable effect upon the market price of their stock, and cause them to rule higher during the year than at present.

The progress made by the New-York Mining Board is slow, but sure. Applications from respectable parties are constantly made for admission, and the business of the board will gradually increase. The difficulty, so far, has been that the majority of orders were for the sale of stocks. As the companies become better known, there will be orders to buy. Even now there is a disposi-

tion to purchase, but although the prices are low, the orders to buy are placed at such a moderate figure that they cannot be filled, and transactions are consequently limited. If the public will pay close attention to the matter and find out the true condition of the companies, they will perceive that there are many on the list of the New-York Mining Board which, though but little dealt in, promise before the lapse of much time to give handsome returns. The companies of Lake Superior are dealt in more at Boston than here, and it would add much to the interest as well as the business of the Board if there were more frequent and larger transactions in them.

We promised in our last to give a list of such stocks as are active, and a comparison of prices during the month of August at the Mining Board, but the transactions have been so limited that it would impart no useful information.

Fluctuations for August, 1853, *in the Mining Stocks during that month at the New-York Stock Exchange Board, showing their highest and lowest points, and the date, with the market value at the close of the month, gain or loss for the month, and number of shares of each sold:*

Mining Stocks, New-York.	Shares.	Par Value.	Highest Sales.	Day Mo.	Lowest Sales.	Day Mo.	Value Aug. 31.	From July 30. Gain.	From July 30. Loss.	Shares Sold.
Cumberland Coal . .	50,000	$ 100	46	27	38½	5	46	7½	–	40,000
Dauphin Coal . .	. . . .	. . .	30	4				–	–	70
Dolly Hyde Copper . .	. . . .	. . .	6	13	4	27	4	–	2½	800
Montgomery Zinc . .	80,000	12 50	½	22	½	16	½	–	½	1,050
McCulloch Gold . .	200,000	5	12½	10	7½	8	11½	4½	–	6,300
New Creek Coal . .	200,000	10	2½	1	2½	22	2	–	½	6,375
North Carolina . .	100,000	5	8½	8	6½	24	7		2½	1,000
New Jersey Zinc . .	. . . .	. . .	11½	2	10½	19	11½	–	½	7,000
Parker Coal . . .	80,000	100	22	1	16	18	16½		3½	50,000
Phœnix Gold . . .	100,000	3	1½	11	1	23	1½	–	–	1,000
Phœnix Coal . . .	. . .	.	20	5	16½	23	16	–	3½	5,000
Pennsylvania Coal . .	60,000	50	111	27	109½	19	111*		8½	1,000
Potomac Copper . .	100,000	10	2	8	1½	1	2	½	–	900

* Ex. dividend.

BOSTON, *Sept.* 20, 1853.

The stringent state of the money market, as a matter of course, unfavorably affected the market value of mining shares, but they have maintained better prices, comparatively, than any other class of stocks. They are in less demand now than one month since, more from lack of funds to operate with, however, than any want of confidence in the public, or unfavorable accounts from the mines.

The principal feature of the month has been the decline in *Forest,* which has touched 6½, about the lowest point since it was introduced into this market, considering that one or more assessments have, in the mean time, been paid in. The highest point it has ever sold at was 25, on the 19th of last April. At a meeting of the *Forest* stockholders, alluded to in our last as about to take place, they voted to lay an assessment of $5 per share, which is to be called in as follows:

$3 per share, ... payable October 10, 1853,
2 " . . . . " January 2, 1854.

No shares can be transferred after Oct. 9th, unless the second instalment of $2 per share is first paid, deducting interest to Jan. 2d.

The stockholders also voted to create three new mines, called the *Devon*, *Shirley*, and *Tremont* Copper companies, comprising 320 acres each, to be organized under the general law of Michigan. The *Forest* Co. is to retain one-half of the shares in each company in payment for the land, and the balance to be sold as wanted for working capital. Subscription books will be opened at the *Forest* Co.'s office for 1000 shares in each company (the whole number being 20,000), at $2 per share, in lots of not less than 50 nor more than 1000 shares.

The following assessments have been called for since our last, and part of them paid in:

	Amount.		When payable.
Manitou,	25 cents per share,	. . . . .	Aug. 23.
Bohemian,	50 " "	. . . . .	Sept. 1.
Norwich,	50 " "	. . . . . .	Sept. 12.
Algomah	$1 00 " "	. . . . .	Oct. 1.

The *Algomah* Co. has been organized under the general law of Michigan and the number of shares doubled, making 20,000. The assessment of $1 per share is under the new organization.

A new company has lately been introduced into this market, called the "*Webster Mining Company*," and sells at 2¼, for $2 per share fully paid stock. The location of the company is upon the banks of Portage Lake, and it is organized under the general law of New-York, for manufacturing and mining purposes, with a capital of $200,000, divided into 40,000 shares at a nominal par of five dollars. 10,000 shares of the stock have been sold for the purpose of raising capital for developing the mine. The location of the *Webster* is considered very favorable, and has been explored by Messrs. Charles Whittlesey and C. C. Douglass, who are both authorities of high character in mineral matters, and the value of the location is also testified to by Wm. H. Stevens, Esq., and by Mr. R. Sheldon; the latter a practical miner of experience, and the former a mineralogist thoroughly acquainted with the whole Lake Superior country. The testimony of all these gentlemen establishes the great value of this tract as far as surface explorations can establish it. Indeed Mr. Douglass who examined the Cliff location before it was opened, declared the surface appearances of the "Webster" more promising than those of that great mine.

The Webster mine is in the immediate neighborhood of the "Isle Royal," "Portage," "Palmer," "Quincy," and "Ripley," and is very advantageously situated for mining purposes, being on the bank of a navigable lake which connects with Keweenaw Bay, an arm of Lake Superior. This gives it great facilities in the transportation of stores for the use of the miners and of copper to market, and obviates the necessity of keeping up a large working force of cattle and horses, which, on Lake Superior, is very expensive. It will also enable this company to ship copper and receive stores whenever the lake is open, while at most of the other mining locations it is necessary, in consequence of the want of roads, to wait until the ground is covered with snow before transportation can be carried on with facility, and the copper thus transported is stored on the bank of the lake until the ice breaks up.

Star Copper, which sold at $2 per share a few months since, is now in active demand at 5 bid. The accounts from this mine are of a very encouraging

nature, and if the present surface indications are carried out, it will become one of the most valuable mines on the lake. A letter from the agent of the mine, dated August 30, says:—"The new vein has been opened at different points to an extent of two thousand feet at the surface, and its richness is extraordinary. In one pit it has been found eight feet wide, and throughout it averages three and a half, perhaps four feet in width. The vein stone, aside from the small pieces of copper it carries, is found to be so strung together with the metals as to render a fracture of it difficult. At most openings it is suitable for stamping."

Recent accounts more than sustain the above, the facts proving an under estimate by the agent, which is rather an unusual feature. In addition to the above, two new veins have been recently explored, both of which carry copper, are well defined and of good width. For a new mine, the *Star* ranks well, and its prospects for the future are second to none, so far as the explorations have developed.

Copper Falls declined to 52 just before the assessment of $2 per share was paid (Sept. 1), but now the stock is firm at 55, with more buyers than sellers. The stock is remarkably well held, and, but for the present demand for money, would advance several dollars per share.

Dana has been in some better demand at $2 lately, but there is nothing of particular importance from the mine. Parties who now make purchases are looking to future developments for their profit. *Fulton* is improving and sells readily at $2, having been heavy at about 1½ for some months. The latest accounts from the mine are favorable, and indicate that it may become of much value. *Norwich* is firm at 10 bid, and a few shares only offered at 12. The agent of this mine gives the most cheering accounts, and holders of the stock have little disposition to part with their shares at any thing like present quotations. *Ripley* is active at about 4¾ (for fully paid stock at $2), and is somewhat of a favorite among purchasers of the low priced shares. The company have a fine location, and have lately purchased an additional tract of valuable land, at a very favorable price, one-third less, it is said, than they would have been willing to pay for the purpose of securing it.

Toltec is in demand at 12¾ to 13, and maintains its market value, better than any other stock on the list. As high as 15 is offered, "buyer's option," twelve months, which is a great advance on the cash price, and tends strongly to show the estimation purchasers have of it for a future value. No parties are bold enough to sell "short" at the present price, and invariably buy the cash stock when selling, "buyer's option."

In the companies not enumerated transactions have generally been light, and do not possess any features of particular interest. The market is quite inactive, with the exception of a few of the mining stocks, held more in favor than the general mass. A relief in money matters would have a very sensible effect upon their current prices; and should such a change occur, it would not surprise us to see a general improvement in the stocks of all the different companies that have furnished proof of their real intrinsic value.

BOSTON MINING SHARE LIST.

Fluctuations for August*, 1858, *in thirty different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

MINING STOCKS, BOSTON.	SHARES.	PAID IN.	HIGHEST SALES.	DAY MO.	LOWEST SALES.	DAY MO.	VALUE, AUG. 31	FROM JULY 30. Gain.	Loss.	SHARES SOLD.
Adventure, Copper,	. .	. .	—	—	—	—	4	—	1	No sale.
Algomah,	20,000	. .	5½	11	4	29	4½	½	—	1,110
Bay State,	. .	. .	—	—		—	2	0	0	No sale.
Bohemian,	. .	. .	—	—	—	—	3½	—	1	No sale.
Copper Falls,	. .	$11,50	59	2	53	29	59	—	7	220
Dana,	. .	. .	2	10	2	31	2	0	0	600
Forest,	. .	. .	14½	2	7½	30	7½	—	6½	1,565
Fulton,	. .	†	‡ 2	3	‡ 2	3	1½	0	0	100
Glen,	. .	†	3	28	2½	12	2½	0	0	48
Isle Royale,	. .	. .	20	20	18	5	19	0	0	310
Malone, *Sandstone*,	. .	†	1½	3	1½	31	1½	—	½	5,905
Manassas, Mining,	. .	† 2,00	—	—	—	—	2½	0	0	No sale.
Manitou, Copper,	. .	1,25	—	—	—	—	2	0	0	No sale.
Minnesota,	. .	. .	200	1	200	3	190	—	10	6
National,	. .	. .	‡ 52	4	‡ 52	4	50	—	2	100
Native,	. .	. .	—	—	—	—	8	—	1	No sale.
North American,	. .	. .	—	—	—	—	7½	0	0	No sale.
Norwich,	. .	3,00	—	—	—	—	11	1½	—	No sale.
North Western,	. .	. .	20	6	20	22	19	—	1	65
Phœnix,	. .	. .	10	3	9	17	9½	—	1½	558
Pittsburg (Cliff),	. .	. .	173	9	173	9	*160	—	4½	9
Ridge,	. .	6,50	—	—	—	—	6	1	—	No sale.
Ripley,	. .	†	5½	11	3½	6	4½	½	—	5,423
Shawmut,	. .	. .	2½	12	1½	6	2	½	—	490
Star,	. .	. .	4	10	3	2	4	1½	—	375
Summit,	40,000	† 5,00	5	2	5	2	5			100
Toltec,	. .	. .	14½	2	12½	25	12½	—	1½	5,674
Winthrop,	. .	. .	1½	3	1½	31	1½	—	½	410
Webster,	40,000	† 2,00	2½	25	2½	30	2½	½	—	150
W. Castleton, *Slate*,	. .	†	‡ 3½	9	‡ 3½	9	4½	0	0	100

* Ex. dividend. † These are fully paid.

‡ The sale of *Fulton* was "buyer's option," four months, and the only one in August. The sale of *National* was 100 shares, "buyer thirty days," and the only one for the month. This lot of *West Castleton* Slate Co. was "seller's option," thirty days. The stock is now worth about $5 per share.

IMPORTATION OF METALS, COALS, ETC., AT THE PORT OF NEW-YORK FROM AUGUST 19TH TO SEPTEMBER 16TH, 1858.

	Quantity.	Value.
Coal, tons	7,793	$ 14,443
Copper, tons	197	18,169
" Sheathing, pkgs	801	42,586
Iron, tons,	7,819	359,950
" Hoop, pkgs	10,493	16,148
" Pig, tons,	9,256	140,252
" Railroad, bars,	88,199	627,727
" Sheet, pkgs	14,497	55,523
Lead, tons	21,773	131,489
Steel,	6,874	128,950
Tin,	27,969	216,554
Zinc,	1,888	46,118
Marble,	190	7,102

METAL TRADE OF THE UNITED KINGDOM FOR JULY, 1858, ETC.

From the Board of Trade Returns we extract the following detailed account of the quantities of metals of home produce and manufacture exported from the

United Kingdom in the month ending the 5th of July, as compared with the corresponding period of the two previous years:—

METALS.		1851.		1852.		1853.
Iron, Pig, ...	tons	22,277	.	28,726	.	36,829
" Bar, bolt, and rod, . . .	"	59,021	.	57,007	.	57,064
" Wire, ...	"	377	.	476	.	816
" Cast, ...	"	2,931	.	6,120	.	5,817
" Wrought of all sorts, .	"	18,141	.	18,754	.	15,118
Steel, unwrought, ...	"	969	.	1,151	.	1,541
Copper, in bricks and pigs, .	cwts.	10,372	.	11,815	.	8,799
Sheets, nails, &c. (including mixed or yellow metal for sheathing),	"	17,986	.	15,779	.	12,094
Wrought of other sorts, . . .	"	1,507	.	3,029	.	1,370
Brass of all sorts, ...	"	1,627	.	2,144	.	818
Lead, ...	tons,	1,986	.	2,484	.	1,155
Tin, unwrought, ...	cwts.	882	.	2,628	.	1,628
Tin-plates, ...	value	£79,510	.	£89,829	.	£47,588

The total declared value of the exports of the above descriptions of metals is as follows:—

	For the month.		For six months.
1853, ...	£1,087,459	. . .	£6,719,695
1852, ...	910,589	. . .	4,562,544
1851, ...	889,665	. . .	4,661,110

On the month, there is an increase of 176,870*l.*, or 19 per cent., and 2,157,151*l.*, or 47*l.* per cent. on the half-year. This extraordinary increase is mainly owing to the augmented exports of iron, for railway and other purposes, to America, the continent, and other parts of the world.

JOURNAL OF GOLD MINING OPERATIONS.

GOLD COINAGE.

The following is the coinage of gold at the Philadelphia Mint during the month of August:

Double Eagles, - - - - -	83,730	$1,674,600
Eagles, - - - - - - -	22,005	220,050
Half Eagles - - - - - -	26,860	134,300
Quarter Eagles, - - - - -	108,264	270,660
Gold Dollars, - - - - -	215,121	215,121
		$1,514,731
In Bars, - - - - - - - - - - - -		605,198 85
		$2,119,929 85

GOLD BULLION DEPOSITED.

From California, - - - - - - - - - -	$4,469,000
From other sources, - - - - - - - -	43,000
	$4,512,000
Gold in July, - - - - - - - - - -	3,505,331

GOLD COINAGE FOR 1853.

January, - - - - - - - - -	$4,809,888
February, - - - - - - - - -	2,981,280
March, - - - - - - - - - -	5,693,808
April, - - - - - - - - - -	5,805,080
May, - - - - - - - - - -	2,823,506
June, - - - - - - - - - -	4,774,216
July, - - - - - - - - - -	4,457,469
August, - - - - - - - - -	2,117,929
	$32,916,706

The coinage at the Philadelphia Mint was commenced in 1793. The amount of its gold coinage, since its organization, has been as follows:

To the close of 1847,	$52,741,850
Year 1848,	2,780,930
Year 1849,	7,948,332
Year 1850,	27,756,445
Nine months, 1851,	35,426,513
	$126,653,570

The coinage of gold at the other Mints has been as follows:

	NEW ORLEANS.	CHARLOTTE.	DAHLONEGA.
To the close of 1847,	$15,189,865	$1,656,060 00	$3,218,017 50
To the year 1848,	358,500	364,330 00	271,752 50
To the year 1849,	454,000	361,299 00	244,130 50
To the year 1850,	3,619,000	347,791 00	258,502 00
Nine months, 1851,	7,500,000	217,934 50	190,152 00
Totals,	$27,120,865	$2,947,414 50	$4,182,554 50

CALIFORNIA GOLD FIELDS.

The past season is represented as having been highly favorable to mining operations in all the gold districts. The claims of the miners are reported as yielding abundantly, by the use of improved means for the extraction of the metal.

A decision, which will be found under the title of "Mining Laws and Regulations," in this number of the Mining Magazine, has been rendered by the Supreme Court of California, which is somewhat out of the usual tenor. The court decided that the mines of gold and other precious metals of California are the exclusive property of the State; that the United States have no interest in them, and cannot exercise any jurisdiction over them. The decision does not include the lands containing the minerals, but only the minerals themselves. If this opinion of the court becomes established as law, it will prove of advantage to the State, by making the mines a source of State revenue, which they never can be so long as they are recognized as the property of the General Government.

An elaborate table has been compiled by Adams & Co., of New York and San Francisco, showing the amount of gold dust and coin manifested from San Francisco for the six months ending June 30th, 1852. The following is an abstract:

	GOLD DUST.	COIN.	TOTAL.
New York,	$24,675,786 68	....	$24,675,786 68
New Orleans,	140,718 00	....	140,748 00
London,	3,504,281 25	....	3,504,281 25
Panama,	793 10	....	793 10
Valparaiso,	246,062 27	2,000 00	248,062 27
Sandwich Islands,	1,000 00	88,251 64	89,251 64
China,	363,651 44	181,071 00	544,722 44
Manilla,	17,450 00	74,761 50	92,211 50
Calcutta,	1,240 00	13,775 00	15,015 00
New South Wales,	38,670 00	14,056 00	52,726 00
Pondicherry,	....	14,525 00	14,525 00
Singapore,	....	8,600 00	8,600 00
Callao,	....	76,672 00	76,672 00
Realejo,	....	5,000 00	5,000 00
Rio Janeiro,	....	500 00	500 00
Totals,	$28,989,552 74	$424,212 14	$29,413,764 88

The coin shipped was of the following denominations:

Doubloons,	$149,548 50	American Gold,	$72,100 00
Dollars,	118,595 00	Unspecified,	75,112 64
Sovereigns,	18,856 00		
			$424,212 14

The progress of quartz-crushing operations in Grass Valley, is thus described at the latest date:

"Two new and powerful quartz mills are being erected. One by the Agua Frio Company, whose machinery is already on the ground; and the other by the Manhattan Company. The machinery of this Company seems to be adapted to the business of quartz-crushing; it combines great simplicity with power, and with less weight of castings than any other kind here.

The "Berdan Quartz Crusher and Amalgamator," will soon be thoroughly tested, a set of them having been put up at the "Helvetia and Lafayette" Company's Mill, where it is now in operation. Another new Amalgamator is now in operation at the Empire Company's quartz mill, invented by Captain Craw, and which I am told is working well.

The Lafayette Company and the Empire Company are able to show weekly returns quite satisfactory to the stockholders, both companies working rich rock, of which they have an abundant supply.

The news from all parts of the mines is encouraging. The different River Damming companies are actively at work, and many are already mining in the beds of the rivers. Some of the quartz companies are also reported as doing very well. One in Butts Co. (the Washington), was averaging $3,000 per week with six stampers.

Gold has also been found near Santa Cruz, which is situated on the north side of the Bay of Monterey. The mines are about eight miles from the town, near the mountains. The country about is timbered with pine and red-wood, and bears a striking resemblance to the country about Deer Creek, in the northern mines, and the earth has the same general cineritious character. The Arroyo, upon the banks of which it is found, is a very brisk little stream. The top dirt is a black and rather sandy alluvial soil, next a cineritious earth, mixed with silex and slate, and below that decomposed granite resting on the bed rock of granite or slate.

The gold is beautiful "*pin-head gold*," (so-called,) very fine, but exceedingly heavy for fine gold. The diggings are about seven miles from the Mission of Santa Cruz, but it is supposed that the same quality of gold may be found in nearly all the small streams and gulches for about thirty miles along the coast and Monterey Bay; and it is believed that this fine gold has been washed out of *quartz rock*, higher up in the black mountains, and which are supposed to be richly impregnated with a similar quality of gold.

Gold has also recently been found at Port Orford; but all accounts as to the value of the mines vary. The "Placer Times," at San Francisco, thus speaks of the quality of the gold :

"At the office of a well-known commercial agency in this city, we were shown several ounces of dust, extracted from sands on the sea-shore at Port Orford. We were also shown the residuum of an assay made by Messrs. Perry, Curtis & Ward, of gold procured from the sea shore as above stated. This was a combination of iridium and platina, in which there was considerable gold that could not be extracted here.

"The following facts of the present state of the miners, we have received from a person who is well acquainted about Port Orford, and who has just arrived thence:

"A few weeks since, some persons discovered the existence of gold on the shore near Port Orford, in such quantities that it was thought advisable to give the matter a fair investigation. The neighbors accordingly made a sluice for the purpose of washing, and they soon found that the result would pay them well

for their trouble and expense. The gold is very fine, and is mixed with a great deal of black sand and platina.

"Our informant says that one day while he was present, two men took out seventy-eight dollars, and four others made twenty-five dollars each; and these were the only persons at work at that place. The diggings, so far as has been prospected, extend about thirty miles along the coast, and for some distance up the Coquille river. The country back of Port Orford is known to contain some rich deposits of gold, and it appears quite probable that there may be as rich mines on the coast as in the interior."

AUSTRALIAN GOLD FIELDS.

The "Melbourne Argus," which has come to be regarded both in this country and England, as careful authority in whatever relates to the gold fields of Australia, presents the following views respecting the permanency of these gold fields:

"On this subject various opinions are entertained; some people boldly asserting that the very existence of these mines will be a matter of history in two or three years; and others, with equal confidence, pronouncing them inexhaustible. Our own impressions, formed upon a tolerably attentive study of the subject, and confirmed by constant intercourse with intelligent men of all classes, who have visited or worked at the mines, are decidedly in favor of their continuance, and of their very considerable further development. The whole history of gold discovery in Australia, seems to point to the almost unlimited extent of the gold fields of the continent, and in spite of all the activity engendered by the desirable nature of the object sought for, it seems unlikely that we have as yet discovered all the gold mines, or even the richest lands which the whole continent contains. Science has done little or nothing for us. Our processes in obtaining the gold are of the rudest nature. The search is characterized almost solely by what the sailors well call "sheer strength and stupidity." From the very extended diffusion of gold throughout the country, it seems unlikely that the fields will be exhausted within any reasonable time.

"Events, we conceive, have shown that a vast belt of highly auriferous land extends across the continent from our own fields to those of Bathurst and its neighborhood, and from thence to the banks of the Hunter, and the back of Moreton Bay; a belt of land of hundreds of miles in length, and of unknown width. This colony, in particular, seems to contain gold in every direction. It has been found at the Pyrenees, at the Wardy, Yallock, at Ballarat, at the Clunes, at Mount Alexander, and Bendigo; at Anderson's Creek, sixteen miles from Melbourne, near Wangaratta, on the Ovens, at Mitta Mitta, on the Murray; it has been found even in the streets of Melbourne itself.

"Even supposing then, that the days of rapid fortunes should pass by, and that by some singular coincidence ignorant men, in a hurried and desultory search, have stumbled upon all the large "nuggets," by which so many of them have been raised to competence in a day, we hold that there are sufficient indications of the almost universal diffusion of gold in this country to justify a belief that an ample return will be attainable for years to come, by any man capable of hard work, and willing to exert himself with industry and steadiness."

The most complete report of mining operations in Australia is presented in the following statement, which is by the latest arrivals:

"The regularity with which large quantities of gold are brought down to Melbourne proves that the diggers do not allow their labor to be interrupted. By a return subjoined it will be seen that the produce of the Victoria gold fields continues rather to increase than diminish. The richest or best worked diggings are evidently at Mount Alexander. As long as the yield in Victoria continued so great, no change in the gold regulations at New South Wales will bring the gold seekers back to the northern fields. It is quite pos-

sible the Sydney diggings may be no less rich than those of the south; nothing is more capricious than the manner in which gold is distributed. But to become popular they must furnish some counter-temptation to announcements like the following, taken from the last 'Geelong Advertiser':

"'Mr. Esmond, the first discoverer of gold in Victoria, has just brought into Geelong a splendid specimen found in White Horse Gully, Ballarat, of the estimated weight of sixty ounces. It was found at fifty-four feet depth, in a seam of quartz running horizontally beneath a hard conglomerated mass of slate and quartz blended. The specimen resembles those masses found at Canadian Gully. The color, shape, and fragmentary appearance of the quartz are the counterparts, in every respect, of those found at the Canadian. White Horse Gully is close to Yuide's home station, and the Ballarat side of the dividing range.'

"Some of the miners now use gunpowder to loosen a bed of conglomerate from five to ten feet thick, which has to be cut through in the works at White Hills and Ballarat. The "cradle," the first and simplest contrivance for washing the stuff, is being superseded by machines that wash greater quantities more thoroughly; the "long Tom" is an enlarged cradle, and the "sluice" is a still more effective arrangement for parties sufficient in number to work it. The whole process is gradually becoming one that requires a certain degree of skill, and that of a kind which must be acquired on the spot; even in discovering the most likely places for claims, geological knowledge is often baffled where a sort of local instinct succeeds. It is the recommendation of one of the scientific authorities of the colony, that persons who have read up their geology for the article 'gold' with a view to the diggings, had better, on arriving there, 'lay all their science on the shelf as soon as possible.'"

The following return gives the quantity of gold delivered from the Victoria fields at Melbourne, by the government and private escorts, in the first four months of the present year: total, 689,429 ounces.

In the corresponding months of 1852, the produce of the same fields were as follows: total, 240,363 ounces.

The increase is 449,066 ounces above the production of the same period last year, or 187 per cent. But it should be remembered the fields are now more extensive, and worked by a greater number of persons. There is no indication that the yield is falling off.

The returns to the 25th of May, make the whole amount for April and May, 268,673 ounces. The weight of gold shipped to London from Victoria in the present year, already amounts to 37 tons, 11 cwt., 1 lb., 9 oz.; value, at £3 15s. per ounce, £3,382,953 15s. sterling.

The operations of the mining companies have not yet gained for them the entire confidence of the public in the colony. It is the general opinion here, that for some time to come it will be impossible to keep a sufficient body of workmen together to render mining on a large scale profitable. There are peculiar influences in the colony that tend to break up any organization for gold mining not formed on the principle of share and share alike, both in the work and its profits. It is not the best system, but perhaps the only one practicable at present. One mining company here is already, it is rumored, on the point of being broken up; and Mr. Hargreaves, the crown commissioner for exploring the coal districts, in his last report to the Colonial Secretary, dated 10th of April, says, "The Great Nugget Quartz Mining Company is diligently endeavoring to ascertain the extent and value of their claims, and is in the course of establishing more extensive machinery than is at present in operation; it appears extremely doubtful that the vein will ever repay the capital that has been expended upon it." For expressing this opinion, the secretary of the company, Mr. Mitchell, has called on Mr. Hargreaves to state as publicly on what data or special knowledge he founds his opinion. The question has not yet been answered. Of the six gold mining companies, five are noted in Barton's Share List, without any quotation of a price for their shares in the colony; of one—the Great Nugget Vein Company—the last London price of its shares is alone given.

MINERALS IN AUSTRALIA.

It is now some weeks since we adverted to the discoveries made by Mr. John Calvert in Australia, and the specimens or rather nuggets he had collected, which it is highly satisfactory to find have since been arranged at rooms, where we were well pleased to find some of an illustrative character of the country, and demonstrative of the value to be attached, whether as specimens, or the result of assays made. We are given to understand that upwards of 8,000 specimens have been collated by that gentleman, of which, however, not above one-sixth is exhibited in his cabinet, while others, however, may be consulted at the "Great Globe" itself, in Leicester square; where, indeed, can be seen the great nugget weighing 134 lbs., in value estimated at £6,000. Mr. Calvert's object, in the arrangement of these collections would appear to be that of illustrating his travels and researches in Australia, with his views as to the electric origin and formation of minerals; and, moreover, to exemplify the analogy between the Australian and English gold-bearing rocks, in reference to the probable development of the gold formations of England, Wales, Scotland, and Ireland. From the non-arrival of the specimens on their way, it is next to impossible to illustrate his several explorations in New Zealand, New Caledonia, &c. Among the many specimens submitted, we may add those attached to mineralogy, comprising a copious illustration of the metals and mineral productions and wealth of the Australian continent, the several metals embracing gold, silver, mercury, platinum, iron, copper, tin, zinc, lead, titanium, iridium, cobalt, antimony, &c. Coal, graphite, slate, limestone, quartz, granite, marble, clays, flint, gypsum, &c. Precious stones, diamond, ruby, sapphire, beryl, chrysoberyl, opal, onyx, agate, hyacinth, garnet, tourmaline, peridot, corundum, cornelian, jasper, malachite. Specimens of gold, &c., from quartz veins, and other mineral productions discovered by that gentleman, the site of which has not yet been made known. The minerals are chiefly arranged according to Mr. Calvert's theory of the action of electricity in the deposition and crystallization of minerals, which may, perhaps, in part embrace that of our scientific correspondent, Mr. Evan Hopkins, whose work has frequently been referred to in our columns. Analyses of gold rocks, according to the electric process discovered by Mr. Calvert. Collections of minerals to illustrate the mineral formations, and the gold productions of England, Wales, Scotland, and Ireland, as gold quartz, gold granite, gold slate, gold gossan, ferruginous gold ore, nuggets, scale gold, &c.; some of these specimens are richer than most from Australia—one containing at the rate of 370 ozs. troy to the ton of ore; another rich specimen is gold quartz from Dolfrwynog, with gold dust from English rocks by Mr. Calvert's process. In addition to this interesting series we have manuscript maps of the geological and mineralogical features of the gold fields and other formations of Australia, with sketches of the quartz-veins appertaining to that country. All these are desirable adjuncts to exemplify the reports of the several mining projects, while the specimens submitted, and which are open to the inspection of the public for a limited period, at once show the mineral value of the country.

GOLD MINES OF NORTH CAROLINA.

From a Report upon the Gold Hill mine in Rowan County, North Carolina, by Dr. Asbury, of Charlotte, we gather some facts in addition to those stated in a preceding page of this number of the Mining Magazine, in relation to the gold mines of North Carolina:—

The veins are numerous, well-defined, and what is very important to easy working, and as a sign of unending depth, they are entirely vertical in their positions, cutting directly across the slate rocks, which have a dip of about 75° towards the north-west. They are already down in some places as deep as 350 feet, without discerning any diminution in the yield of the gold; and what is

very encouraging, they find at this depth that copper ore of good quality is beginning to make its appearance, so that the greatest certainty is felt that the income of the mines is about to be augmented by valuable returns in this metal also.

From the statistics given by Dr. Asbury, it appears that the Gold Hill mines have afforded $1,500,000 since their discovery in 1843, and that their exploration has led to the growth of a village of above 800 inhabitants, situated directly over the mines. They have, moreover, been operated with a very inadequate force, and much of the time have been interfered with by legal disputes and other embarrassments. They are at present, however, making very rich returns to the various parties interested in them, as owners of the soil and lessees.

The average yield of the ore by the first process is $1 50 per 100 lbs.; but the sands are re-washed, on toll, by different parties of adventurers to the number of five times. The improvements now in progress for a better grinding of the ore, and for securing a more perfect amalgamating process, it is confidently believed, will greatly enhance the value of these mines.

The famous mine of Dorn, in Edgefield. S. C., is also referred to, in this report. It is the only one in the United States which at present is worked to a greater profit than the Gold Hill mines. In Dorn's mine, it has been a very common result for the hands to average $50 each, per day! A single blast of powder has often thrown out $500 in fragments of gold, which the miner could at once step forward and gather up in his hand! This mine is now yielding $200,000 per annum, with a force of scarcely more than twenty men!

The mines at Gold Hill, it may be added, are situated in a perfectly healthy country, as is proven from the fact that they are wrought by European miners and native white laborers.

SEPARATION OF GOLD FROM ARSENICAL PYRITES, ACCORDING TO PLATTNER'S METHOD.—BY W. GUETTLER.*

The mines of Reichenstein, in Silesia, abandoned for more than five centuries, have been recently opened with advantage, in consequence of the application, on a large scale, of a method invented by Professor Plattner, for separating gold from the waste of arsenical ores.

The ore at Reichenstein is an arsenical pyrites, containing about 200 grains of gold in the ton. The ore is roasted in a reverberatory furnace surmounted by a large condensing chamber, in which the arsenious acid is condensed as fast as it is volatilized. There then remains on the floor of the furnace, oxide of iron mixed with a certain quantity of arsenic, together with the whole of the gold. This is placed in a vessel so arranged that a current of chlorine can be passed through it, by which the gold and iron are taken up, and afterwards separated from the residuum, by the aid of a certain quantity of water, and the gold is afterwards precipitated from this solution by sulphuretted hydrogen. To prevent the admixture of iron at this stage, a small dose of hydrochloric acid is added to the solution before the sulphuretted hydrogen is introduced. The auriferous compound having been separated from the liquor, is washed and heated in an open porcelain crucible, to drive off the sulphur, by which the gold is reduced to the metallic state, by fluxing it in the usual manner.

This simple and ingenious method, which has made it worth while to reopen the Reichenstein mine, is equally applicable to the vast quantity of refuse accumulated near many other old works. In awarding the Council Medal, the Jury have desired in this case to associate the name of Professor Plattner, the inventor of the method, with that of M. Guettler, who has brought it into operation on a large scale.

* From the Reports of the Juries of the Exhibition of the Works of Industry of all Nations, 1851, London.

LONDON AND VIRGINIA GOLD MINING CO.

The directors of the London and Virginia Gold and Copper Mining Company have received and circulated the report of Captain Hitchins among the shareholders. Captain Hitchins went to Virginia in June, and has lately returned. It appears, from his report, the mine is a very valuable one. There is silver and copper ore in it, but Captain Hitchins states that it is his present belief that for a time the main produce will be gold. It can be most profitably worked, but the assay of the ore brought by Captain Hitchins not having yielded so much as a former assay referred to in the prospectus, the directors have made a new contract, by which the vendors have accepted, as a present payment, half the amount originally agreed to be paid, upon conveyance, in cash and shares, and have postponed a large portion of the price until the shareholders shall have received a dividend of 25 per cent. The directors have issued a report along with that of Captain Hitchins, in which they state that instead of £50,000, as originally proposed, £25,000 will be sufficient capital for the purchase and full development of the mine. They have made a call of 5s. per share, and they believe that, in addition to the deposit already paid, this will suffice.—*London Daily News.*

JOURNAL OF COPPER MINING OPERATIONS.

COINAGE OF COPPER.

The coinage of Copper at the Philadelphia Mint for 1853, has been as follows:

January,	$3,860 79
February,	2,000 31
March,	4,131 26
April,	2,515 54
May,	9,120 19
June,	3,667 32
July,	1,832 28
August,	5,594 60
	$32,718 29

The coinage of Copper since the organization of the Mint has been as follows:

To the close of 1847,	$1,145,591 21
Year 1848,	64,157 99
Year 1849,	41,984 32
Year 1850,	44,467 50
Nine months, 1851,	85,442 43
Total	$1,381,643 45

LAKE SUPERIOR COPPER MINES.

With regard to the result of farther explanation during the season, the Lake Superior Journal makes the following statement:

We have received the most flattering accounts of the recent discoveries made on the Wisconsin side of the mineral range of Lake Superior. A number of exploring parties have been into that section of country this season looking for mineral, and several promising copper veins have been discovered and a number of locations made. The mineral range lies along the extreme south-western portion of the lake, and is accessible from the lake. The veins are simlar

to the other native copper veins of the lake, and they will undoubtedly prove as rich and extensive as those in Michigan.

The Albion Mining Company have commenced opening a new vein, recently purchased, which is thus described in the letter of the superintendent:

The mineral property lately purchased by the Albion Mining Company, consists of one hundred and sixty acres of land. It is situated within sixty rods of the south shore of Portage Lake, Lake Superior, and it lies towards the south-eastern side of the trap range, on a slope from the lake of about one in five.

There are six large veins known to be passing through the tract, but the one opened is a continuation of that on which the "Isle Royal" and "Portage" mines are being wrought, and the workings of the latter are near your boundary. The average width of this vein is about fourteen feet, and it is composed of epidote, calc-spar, quartz, amygdaloid, and copper.

The following is the letter of the exploring geologist, Prof. J. T. HODGE, to the President of the Company:

SAUT STE. MARIE, Aug. 4th, 1853.

SIR,—In accordance with your letter of instructions, of the 17th ult., I proceeded to Lake Superior, and have with great care examined the tract of land owned by the Cacique Mining Company, and although I had, from long acquaintance with Captain Edwards, great confidence in his judgment and integrity, yet, as I wrote to you from this place on my way up the Lake, I visited the location with a conviction in my own mind, amounting almost to a certainty, that, in this instance, I should, on examination, be compelled to report against the purchase he recommended of the tract by the Albion Company; but, after an examination of the principal vein on this tract, as also of the workings on the same vein on the adjoining Isle Royal and Portage mines, I have found the vein *so large and so productive in copper*, that I am compelled to decide in favor of the purchase by your Company, and have, in accordance with my instructions above referred to, directed Captain Edwards to transfer all his men and movable property from the old workings of the Albion Mining Company to this location.

Captain Edwards will immediately furnish you with his plan of working the mines, his estimates of the expense of the same, and of the probable product for the next three years; and I take pleasure in adding that I think the great experience of Captain Edwards, both in the mines of Cornwall and Lake Superior, together with his well-known caution in all mining calculations, will justify great confidence in his judgment and estimates.

In conclusion, I will add that the surface indications of this property are such as unquestionably to warrant the expectation that it will become one of the most valuable copper mines on Lake Superior. On my return to New-York, I will report in detail. Very respectfully, I am yours, JAMES T. HODGE.

Of the mining operations west of the Ontonagon river, we find some important particulars in a recent number of the Lake Superior Journal:—

Among the mines west of the Ontonagon river, the Norwich continues to attract the most attention, and was never showing more copper in its shafts and drifts than at present. The long adit level, which will drain the mine at a great distance below the surface, and enable them to take out the copper on tram roads instead of hoisting it to the surface, is now nearly up with the shaft, and will connect with it in a few days. They have shipped, this season, some thirty tons of copper, and have on hand, ready for shipment, about as much more. Mr. Davis, the superintendent, is preparing for extensive operations during the coming winter.

The *Pittsburgh Mining Company*, whose works are near neighbor, on the west, to the Norwich mine, are making some discoveries underground of an interesting character. Mr. Moyle, their able Cornish superintendent, took the course of the Norwich vein and commenced sinking a shaft, a few months ago,

where there was no sign of the rock, and at the depth of about forty feet, through sand and gravel, he struck directly on an east and west vein, and also what appears to be a north and south vein. On drifting to the north and sinking still further, he found a still more promising east and west vein than the first—some four feet in width, carrying small pieces of copper and rich stamp work. This is a promising beginning for a mine.

The *Windsor Mine*, adjoining the Norwich on the east, under the superintendence of Daniel Plummer, promises to be like its neighbor, rich in mass copper. Mr. Plummer has worked only a small force of men, since the commencement of operations on this location, but he has made every thing tell in the systematic opening of his mine. The Windsor vein is identical with that of the Norwich.

The *Colling Mine*, situated next to the Windsor, on the east, is looking better in their new diggings than in the old. They have found a larger and more regular vein, which promises well for the amount of work done.

The *Forest Mine*, the first mine west of the Ontonagon river, is improving as they work south on the vein, and is turning out considerable copper in mass and barrel work, besides the large amount of excellent stamp stuff.

The *Ohio Trap Rock Mine*, under the management of Mr. Buzzo. is presenting a good show of copper from the new vein which has recently been opened, and which is likely to prove the main vein. They are taking out very rich stamp work and some small masses.

The following very complete sketch of the Portage mining region, where operations have commenced but recently, is from the pen of the editor of the Detroit *Daily Advertiser*, who has made an interesting and observing tour through this region the last few months:

The Portage mining region, though comparatively newly opened, is already attracting much attention among the scientific and business circles, from the peculiarities which are presented by explorations and mining operations; indeed there is no region upon Lake Superior towards which more interest is manifested.

The mouth of the Portage river is upon the east side of Pt. Keweena, about twenty miles from the extremity of the point. This river, in ascending, soon opens into Portage Lake, which is twenty-five miles in length, some three miles in width, and which with its bays cuts off the point about twelve miles from its base, except a portage on the west side of about one mile. This portage is made for the most part across a swamp, and extends from the bayous of the Portage lake to the "Portage," as it is called, on the west side of Point Keweena. The general direction of the river and lake is west by north. The veins of this region may be easily traced by the numerous pits which have been sunk by the ancients, or "mound builders." They occur in gangs of three parallel veins. The mines which have been most developed are the Isle Royal and the Portage.

The Isle Royal or "Sheldon Vein," as it is sometimes called, has been traced from the south side of sec. 2, in township 54 north, of range 34 west, northeasterly across Portage lake. This mine has an elevation of three or four hundred feet from the surface of Portage lake, from which it is distant one and a half miles in a southerly direction. The direction of the vein is north 33 deg. east, and has been opened on this location by four shafts, at no point of which has the width been less than eight feet. No. 2 shaft at this mine has been sunk sixty-six feet, and the vein has been found fourteen feet in width at the bottom; a drift has been cut north from this shaft entirely on the vein, seventy feet in length, showing it remarkably rich in barrel, masses, and stamp work. No. 3 shaft, which is two hundred feet south of No. 2, has been sunk 120 feet deep, producing copper the entire depth in form of barrel, stamp work, and masses. The vein here is 12 feet thick at the ten fathom level, and from it there is a drift south of sixty-four feet. The appearance of the mine is highly prosperous, and

its management, which is under the charge of C. C. Douglass, Esq., is highly skilful, judicious, and economical. Its stock sells at the board for fifteen dollars.

Portage Mine.—Directly north of the Isle Royal, and within about half a mile of the lake shore, lies the Portage mine, carrying the same vein, with the same indications which are presented upon the former. Four shafts have been sunk upon this vein, and its appearance justifies very high expectations. No. 1 and 2 shafts have been sunk about 70 feet, from which barrel, stamp and small masses have been taken. No. 3 shaft, which is just commenced, is found to be very rich. No. 4 shaft is on the vein 200 feet distant from No. 1, 66 feet in depth, and has produced copper from the surface.

The *Cazique Mine*, which has lately been bought out by the old Albion company. formerly operating one mile south-west of the North American, takes the Isle Royal vein, and work is just commencing upon it with fine prospects. This location is directly east of the Portage.

The *Webster* is a new enterprise, lying east and south of the Cazique or Albion, and east of the Isle Royal.

The *Montezuma* is also a new mine, taking the parallel vein of the Isle Royal, and lying directly west of the Portage mine and directly on the lake shore. Old practical miners have the greatest confidence in this location, and the operations now about to commence upon it will, without doubt, satisfy their hopes.

The *Dacotah*, a new enterprise, lies still west of the Montezuma; a tract of land lying south-west from the Isle Royal mine, and taking the same vein, is owned by Phelps, Dodge & Co., of New York.

This disposes of the Portage mines south of the lake, and we next come to those across it, which are

The *Quincy Mine*, lying on the west of Portage lake, directly opposite the Montezuma and Dacotah. This mine is employing a small force, in mining and exploring. The company have lately opened three new veins, from one of which they have taken several lumps or small masses of copper, varying from one to two hundred pounds. The mine looks and promises finely.

The *Pewabic*, which is a new company, lies directly on the north shore of the lake, east of the Quincy, is employing a few men and have opened their vein with fair prospects.

The *Ripley* is a new enterprise, the location of which is east of the Pewabic, on the north shore of Portage lake, having an extensive front on the lake, and taking the Isle Royal vein after it has crossed the lake. The Ripley has opened five new veins which vary in width from three to fourteen feet, which are rich in shot copper. Two other veins have lately been discovered upon their location, and are now employing thirty men, with fine prospects. The stock commands five dollars per share.

The *Cornwall* lies directly back or still north from the Ripley, and about two miles from the north shore of Portage lake. This is a new mine.

Mr. Ransom Sheldon, the enterprising Superintendent of the Isle Royal and Portage mines, jointly with Mr. Douglass and the original proprietor of the Isle Royal location, foreseeing the amount of business which must ultimately spring up upon the Portage lake, has secured the immediate lake front for a considerable distance, from which operation he must realize a handsome sum.

The novelty of the leading characteristic of the Portage mines is the great width of the veins, and the friable character of the rock of which they are composed, and in which the copper is found. It is by no means unusual to find the vein fourteen feet in thickness, and carrying rich stamp and barrel work, and small masses easily handled, not generally exceeding five hundred pounds in weight. These two circumstances together, combine to make the mines at this point very easily worked and productive; hence the popularity which their stocks enjoy, and the confidence with which practical men regard them. The only drawback upon them, which it must be admitted is a serious one, is the small

quantity of land possessed by them; very few of the mines owning over one section.

The *Bruce mine* is on the Canadian side of the Lake, at the north-western extremity of the Georgian Bay. A recent visit to it, by one familiar with mining operations, is thus briefly described:

It was evening before we reached the pier in front of the mine, but not so dark as to prevent our seeing, to good advantage, the little village of white houses that has sprung up, as if by magic, on this rocky shore. The noisy stamps and pumps were in motion, and the lights about the engine soon attracted us in that direction. We were politely taken through and shown the extensive engine-house, and other works, and never have we seen a finer engine in motion than this. It is of Cornish make and style, large and powerful; and it is the most finished mining engine in this region of the world. This does the stamping, crushing, pumping and much other work of the kind, and was intended for an extensive smelting apparatus which has been erected, but which is not now in use.

We learned from a gentleman connected with the establishment, that the company have shipped this season about 1400 tons of dressed ore to Swansea, England, and to the Bergen Point Smelting Establishment, near New-York city. Their ore yields a very high per centum of copper, and exceeds, as a general thing, the best ores of Cornwall. They expect to ship about 400 tons of ore more this fall, and had it not been for the scarcity of miners this season, they would have shipped over 2000 tons of ore. They have at this time but a small force of men engaged in mining, and, as near as we could ascertain, their whole number of men would not count over one hundred. They have undoubtedly a rich vein of copper and one that will pay handsomely for working. They have declared a dividend this season of $1 per share of their issued stock, 45,402 shares, and they are in a fair way to make another soon.

Another mine has been commenced on the same range of veins, about three-fourths of a mile west of the Bruce, to be called the *Wellington* mine. The company are now engaged in erecting houses preparatory to the commencement of mining, and the surface indications are favorable for the enterprise. Mr. Vivian, of Cornwall, and lately of the New-York and Michigan mine of Lake Superior, is to take charge of this concern. We believe this to be a district as rich in copper as ever was Cornwall. As yet very little is known of the country. Veins have been found in many places, and rich specimens have been taken from them, and still there are no laborers in this field of enterprise to test their value and extent. The evening before we made our visit at the Bruce mine, explorers came into that place with beautiful specimens of copper from new localities in that neighborhood; and every discovery underground and at the surface, goes to show that here is a mineral region that will sooner or later be taken up and occupied by mining capitalists.

RECENT ENGLISH PATENT FOR IMPROVEMENTS IN OBTAINING COPPER AND OTHER METALS FROM ORES, OR MATTERS CONTAINING THEM.—TO THOMAS TRUEMAN, SWANSEA.

This invention consists in acting on oxide ores (or sulphuret ores, after they are reduced to oxides by calcination), by digesting them in acids, and afterwards applying muriate of lime, and lime. If sulphuric acid be used for extracting copper from the ore, the copper alone will be dissolved, and may be drawn off; leaving sulphate of silver, which is to be washed out by hot water, and added to the sulphate of copper previously ran off. Common salt or muriatic acid is to be added to this solution, to throw down the silver as a chloride; the solution of sulphate of copper is then to be run off, and muriate of lime added to it to form muriate of copper, and a precipitate of sulphate of lime. The muriate of copper thus formed, is to be run off, and lime added to it to throw down the copper in the form of oxide, leaving muriate of lime in solution, which is to

be again used for the previous process. The oxide of copper and the chloride of silver are to be treated in the usual way to obtain the metals. The residue in the first tank, after the copper and silver solutions have been drawn off, is to be boiled in a solution of caustic alkali to extract the oxide of tin, which may be obtained from the caustic solution by various means; or the residue may be smelted in the usual way to obtain tin. If muriatic acid be used, the copper alone will be dissolved out, and may be at once treated with muriate of lime, and lime, as before stated; the chloride of silver, left in the first tank, to be dissolved out by a hot solution of common salt, or of hyposulphite of lime from which the silver may be obtained by various means; the residue is to be treated as before. If nitric acid be used, both silver and copper will be dissolved. The silver may be obtained by the addition of salt, or muriatic acid, the same as from the sulphate of copper solution. The copper is to be thrown down from the solution by soda or potash, forming a solution of nitrate of the substance used, and the solution may be evaporated to obtain crystals; the residue in the first tank is to be treated as before. Some of the slugs, obtained in smelting now in use, are proposed to be treated in a similar manner; that is, by digesting them in acid.

Carbonates of copper may also be treated in a similar manner, with or without calcination, that only being necessary when other metals are present which it is desirable to separate from the copper. By the calcination, some will be per-oxidized and rendered less soluble in acids, and others will be drawn off, two or more acids may be be used together, the after treatment being varied accordingly.

In the treatment of sulphuret ores, the ore is to be ground to fine powder and calcined, at a gradually increasing heat for about twenty-four hours, in order to drive off the sulphur. It is necessary to keep it at a good red heat for the last six hours, which will have the effect of per-oxidizing any iron or tin that may be in the ore; the sulphur should be driven off as completely as possible, and also the arsenic and antimony, if there be any in the ore. In some cases it may be found necessary or convenient to partially calcine the ore before grinding it to powder; in which partially calcined state it is more easily ground, and, after grinding, may be calcined to finish the operation. When the calcination is completed, the ore is to be removed to tubs or vats, or other suitable vessels, and acid added in proportion to the quantity of copper and other metals to be acted on contained in the ore; the proportions to consist of one equivalent of acid to one of copper in the ore, and an additional quantity of acid to act on the silver, if any be present in the ore; water is then to be added to the ore, and acid in the vessel, so as to make an equal or greater weight of water and acid than there is of ore; the whole is then to be boiled and well stirred during the operation. The boiling should be continued for several hours, at the end of which time the ore may be allowed to settle and the supernatant solution drawn off into a tank, which may be called No. 1. Fresh water is then to be added to the ore, to wash out all the copper, and this washing may be added to the solution first drawn off. If the sulphuric acid has been used for acting on the ore, the water used for washing is to be hot; if it is desired to obtain silver from the ore, by the use of hot water the sulphate of silver, previously formed, will be dissolved. This solution may be added to the first portion drawn off; and to it must then be added a muriate (common salt or muriatic acid are the most suitable), sufficient to precipitate all the silver, which may be allowed to remain at the bottom of the tank till a considerable quantity has accumulated. When the precipitation has taken place, the solution containing copper, and perhaps a little iron, is to be drawn off into another tank, No. 2, and chloride of calcium is added,—which will throw down sulphate of lime, leaving chloride of copper in suspension. This solution is drawn off into another tank, No. 3, and milk of lime is added thereto to throw down the copper an an oxichloride: the solution and precipitate, in this tank, should then be well boiled, to concentrate

the precipitate; after which the liquor may be drawn off and used for the previous operation.

The precipitate of oxichloride of copper may accumulate in the bottom till it becomes a foot or more in thickness; and it should then be removed, dried and fused in carbon, to obtain metallic copper. The chloride of silver in No. 1 tank, when a sufficient quantity has accumulated, may be treated in the usual way, to obtain metallic silver.

If, after boiling the ore with acid in the first vessel, and washing it with water, copper should then remain in the residue, a further quantity of acid must be added and the boiling repeated. When all the copper has been obtained, the residue, if containing tin, is to be washed with water, allowing the particles to arrange themselves according to their specific gravity; the oxide of tin being heavier, may thus be obtained nearly free from oxide of iron and earthy matters, and may be reduced by carbon in the usual manner. The residue in the first vessels may be treated with a strong solution of caustic alkali, for dissolving out the oxide of tin, which may be obtained from the solution by the addition of a large quantity of water. This treatment, or that of washing, may be used so as to arrange the particles according to their specific gravities.

The acid preferred to be used is the muriatic, which may be employed in the following manner: if silver is in the ore, the acid should be sufficiently diluted to prevent the chloride formed from being dissolved, as it should remain in the first vessel with the residue. The chloride of copper, formed at the first washing and boiling of the ore, after being run into No. 1 tank, may have milk of lime added at once, and after boiling in this tank, the solution of chloride of calcium may be allowed to run to waste, or, if found of commercial value, it may be crystallized. The precipitate of oxichloride is to be treated as before directed.

The residue in the first vessel, if containing silver, is then to be treated with a hot solution of common salt, or hyposulphite of lime or soda—the latter salt being preferred; from which, after the solution has been drawn off into another tank, the silver may be precipitated by placing in the solution pieces of iron or other suitable metal. The residue may now be treated as before for tin. "Nitric acid may be used as well as either of the former acids, the solution of copper with which is to be precipitated by potash or soda, which solution, being drawn off from the the precipitated oxide of copper, is to be evaporated and crystallized to obtain nitrate of soda or potash."

As silver will have been dissolved in the first vessel by the use of pure nitric acid, it is advisable to use a very little muriatic acid mixed with the nitric, which will cause the silver to remain in the first vessel with the residue, which is to be treated as directed when muriatic acid has been used.

The slugs produced by the present methods of copper smelting are proposed to be treated in the same way as ore. The slug is to be ground to a fine powder, and cleaned in the same way as the ore, so as to oxidize the various metals which it contains; the subsequent treatment will be the same as with the ore.

Carbonates and oxides of copper may be treated in the same way, either with or without calcination, that only being necessary when other metals besides copper are contained in the ore, and are required to be separated therefrom.

Although the chloride of silver is proposed to be separated from the residue by a solution of common salt, hyposulphite of lime, or soda, the separation may also be effected by the use of mercury, as is well known. The copper may also be precipitated from its solutions by the introduction of another metal, such as iron or zinc.

The patentee remarks that he is aware that acid has before been used to separate small quantities of copper from tin ores; he does not, therefore, claim the same; but what he claims is, the mode herein described, of separating copper from copper ores and slugs; and he also claims the application of earthy and alkaline hyposulphites for dissolving chloride of silver.

IMPROVEMENTS IN CALCINING CERTAIN ORES, AND IN THE CONSTRUCTION OF FURNACES FOR THAT PURPOSE; AND FOR CONVERTING CERTAIN PRODUCTS ARISING IN THE PROCESS INTO AN ARTICLE OF COMMERCE, NOT HERETOFORE PRODUCED THEREFROM. Patent dated December 31, 1852. THOMAS BENJAMIN SMITH, of Bristol.

This invention has reference more particularly to the first operation in smelting sulphuret copper, and other ores; namely, their calcination, by which a portion of the sulphur is expelled, and the metals they contain are oxidized. The inventor proposes to avoid the inconvenience and injury of the ordinary process caused by allowing the free vapors to pass into the open air; and, by condensing the metals which are evolved in the process in flues or pipes, to use the sulphurous vapors for the manufacture of sulphuric acid. For these purposes he uses nearly-closed chambers, furnaces, or retorts, which are heated from without, and by passing heated air into these he does not admit the products of combustion from the fire to mix with the vapors or gases evolved in the process of calcination, as such products would render these vapors unfit for the manufacture of sulphuric acid. With the chamber, furnace, or retort employed he connects suitable flues or pipes, to carry away the vapors, in which he condenses the volatilized metals, while the sulphurous vapors are carried away to suitable chambers, and proceeded with in the ordinary manner of obtaining sulphuric acid from them.

When sulphuric acid is not needed, the process of calcination may be much facilitated, by introducing a much larger quantity of air, which will be an advantage to the smelters.

The inventor also proposes to use a portion of heated oxygenated air at times, to assist the calcination of metallic ores.

Claims.—1. The improved plan of constructing a calcining furnace as before described.

2. The improved mode of calcining, whether the manufacture of sulphuric acid be combined therewith, or not, as described.

3. The use of heated air blown into, or on to the ore in the chamber, furnace, or retort, whereby the calcination of the ore is much facilitated.

4. The manufacture of sulphurous acid from the sulphurous acid obtained in and by the process of calcination.

COPPER SMELTING.

Mr. William Henderson, of Bow Common, has lately taken out a patent for the invention of "improvements in manufacturing sulphuric acid and copper from copper ores, regulus, and matts." The patentee proposes to separate the sulphur from the other matters, and treat it for the manufacture of sulphuric acid, and to act upon copper ores and regulus so that they may be converted into copper by more simple processes than hitherto; dividing his copper ores into three distinct classes, and treating each variety differently, according to the per centage of sulphur they may contain. This first class comprises all above 25 per cent. of sulphur, the second all between 10 and 25 per cent., and the third all under 10 per cent. He states the difficulties in the way of manufacturing sulphuric acid in copper ores have been threefold—the first is, the high heat by which the greater portion of the sulphur is separated from the copper, would destroy the vitriol chambers; the second, the carbonic acid gas and other gases in combination with the smoke, if they did not injure the chamber, are so great as to necessitate a large quantity of nitrate of soda to neutralize them; and third, a large amount of sulphur is sublimed or changed from the ore, which, if passed into a vitriol chamber in this state, would remain as sulphur, and very much retard the production of sulphuric acid. The first objection he proposes to remove by separating all the available sulphur by calcination at a low heat, and superseding, as much as practicable, roastings; the second, by removing a certain class of ores without the aid of fuel, and another sort, in close calciners, by causing the smoke and the gases from the ore to pass separately from the fur-

nace; the third, by conveying the gases from the calciners over the kilns in which the ores of the first class are burning by their own power of combustion; by this means all the sulphur that has been sublimed is readily converted into sulphurous acid. The first class of ores he proposes to burn in small cylindrical kilns, after the manner of mundic kilns, they being broken into pieces not larger than a goose's egg; this mode of calcination, we may observe, in round or square kilns, dry built, is universally used in Sweden and Norway. In these countries where fuel is cheap, about 4 fms. of wood is sufficient to calcine from 80 to 100 tons of ore; the sulphur obtained from them is, however, put to no practical use. The second class are calcined in closer furnaces; and the third, with the calcined ores of the first and second class, are likewise smelted for regulus. The whole of these are to be crushed fine enough to pass through an eight-hole sieve. We shall not enter into further detail of Mr. Henderson's patent, as a great portion of it, as he candidly admits, is known before. That by it he may obtain sulphuric acid in an easier method than that at present employed is possible, but it is questionable whether it would be at a less cost.

The simple fact of dividing the ores into three classes would of itself show the increased amount of labor that must accrue, and this would likewise be the case in the tedious operations which would have to be carried on through the smelting works. The admixture of silex to form a silicate of iron in the slag would likewise cause an extra expense, and it is problematical whether the sulphuric acid so obtained would repay the cost of its production. Many improvements which are found to work well theoretically, when practically tried are found wanting. We by no means infer that this is the case in the present instance, but looking at the number of patents that have been issued for improvements in copper ores, and the few that have been practically useful, we are inclined to suspend our judgment until some positive results are attained. Lately we have seen the project of a German, who proposes to obtain at a profitable rate the copper from ores of ½ per cent.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SILVER COINAGE.

The coinage of silver at the Mint at Philadelphia has been as follows:

January,	$98,750
February,	97,800
March,	163,890
April,	419,207
May,	603,509
June,	650,000
July,	710,000
August,	850,000
	$3,592,866

Silver bullion deposited for the same period, value, $860,000.

PIECES COINED.

Half Dollars,	368,000	$184,000
Quarter Dollars,	2,324,000	581,000
Dimes,	590,000	59,000
Half Dimes,	520,000	26,000
	1,802,000	$850,000

The silver coinage of all the mints of the United States has been annexed. Only gold is coined in the mints of Charlotte and Dahlonega.

	PHILADELPHIA.	NEW ORLEANS.
To the close of 1847,	$62,748,211 90	$8,418,700
Year 1848,	420,050 00	1,620,000
Year 1849,	922,950 00	1,192,000
Year 1850,	409,600 00	1,456,500
Nine months of 1851,	283,874 00	206,000
Total,	$64,784,685 90	$12,898,200

The total coinage at all the mints since their organization to October, 1851 has been $239,963,933 85.

SHIPMENTS OF LEAD FROM THE UPPER MINES IN AUGUST, 1853.

Shipped by river from Galena,	24,702
" railroad "	700
" from Dubuque, Potosi, &c.,	6,041
Total,	31,443
Shipped same month in 1852,	34,245

NORTHERN LEAD MINES.

The following correspondence has appeared since the September number of our Magazine was issued. We shall invariably find a place for all mining reports vouched for by the officers of a company. Thus we hope to be able to preserve in our pages, and furnish to our readers all that is reliable in the progress of every mine of any pretensions in the country:

HON. J. C. FORSYTH, PRESIDENT :—

SIR,—The usual monthly report of Captain Dunkin, the mining agent, together with vouchers Nos. 443 to 447, inclusive, is herewith transmitted. The monthly balance sheet will be transmitted by Captain Dunkin, from Rossi, by the next mail, so that the Board can compare the same with the vouchers.

Since the important development of mineral mentioned in Captain Dunkin's report, as having been recently made in Crystal shaft, one of your committee, (Mr. Myers) has made a personal examination of the mine underground, in company with the Secretary. The magnificent leader of lead there uncovered, cannot fail to inspire the most unbounded confidence in the success of the mine, lying as it does, under the extreme eastern portion of the works, and answering the expectation of those who anticipated that the lode would reappear, (the bar of poor ground having been passed,) at about the depth where it is actually found in all its original strength.

This leader is eighteen inches in width, and presents every appearance of continued increase. It has steadily increased, and uninterruptedly for the last eight feet of excavation, and now presents a literally solid leader of the purest Galena, unmixed with spar or any other substance, at the least eighteen inches wide across the lode, and for the whole length of the shaft of about eight feet, without the least show of failing at either end.

When it is considered that the leader at the lowest portion of the mine, near the most western works, is worth, in the opinion of Captain Dunkin. $120 a fathom, the most confident expectations may, it seems to your committee, be entertained that the rich lode which appears in the Crystal Shaft, extends throughout the whole length of the present excavations at the base.

The best feeling seems to prevail at the mines amongst all classes, and your committee cannot refrain from offering to the Board their congratulations at this most opportune development of the treasures of the mine.

We have the honor to be, sir,
Your obedient servants,
CHARLES G. MYERS,
CHARLES L. SCHLATTER,
Executive Committee,

Ogdensburg, Aug. 24, 1853.

THE EXECUTIVE COMMITTEE OF THE GREAT NORTHERN LEAD MINES.

GENTLEMEN :—I beg to lay before you this my monthly report on these mines :—

In the Engine Shaft the lode is three feet wide, improving in its appearance, and I think the time not far distant when I shall be able to speak of important improvements at this point.

In sinking under the bottom of the western section the lode is just as when last reported—three feet wide, worth $120 per fathom.

In sinking the Crystal Shaft under the bottom of the eastern section, we have made an important discovery of a solid leader of lead, eighteen inches wide, worth at least $500 per fathom—lode 3½ feet wide. The importance of this discovery will be seen when you consider the richness of this lode above in the former workings; and it proves the correctness of the theory advanced by those who were of opinion that the lode would be rich again below, provided that there was no alteration in the circumstances in connection with the lode or stratum in which it is embedded.

The dressing and smelting are going on favorably, and for the time to come our returns will be regular.

I congratulate the stockholders on the present prospects of the mine, and I think in a little time it will make one of the most important and valuable mines in the United States. I am, gentlemen, your ob't servant,

JOHN DUNKIN, JR.

Lead Mines, Rossie, Aug. 23, 1853.

SILVER.

The territory of the Spanish Peninsula is one of the richest in Europe in silver, and possesses great advantage over the other nations. Spain, till these late years, has produced 184,158 marcos (113,533¼ lbs. troy), of silver, whose value has surpassed 35,000,000 of reals (about $1,822,000), but since the discovery of the Hiendelaencina mines in the province of Guadalajara, that produce has much increased. One of these mines alone, in the said province, has already yielded upwards of 20,000,000 of reals (1,050,000.)

According to the last documents published by the Spanish Government, that country produced in 1846, 547,143 quintals (510,484 cwt.). of lead, whose value amounted to 37,000,000 of reals, (1,927,000.)

THE SILVER MINES OF CHIHUAHUA, MEXICO.

The particulars of the following information concerning the Silver Mines of Chihuahua, are chiefly taken from a memoir written by a Mexican gentleman well acquainted with the subject, and were translated for the *New-York Daily Tribune*—where they appeared with other facts over the signature of that accomplished miner and geologist, "Julius Frœbel." Some of these silver mines have been at periods among the richest on record.

The silver in the western part of the State, of the mines of the Sierra Madre and its neighborhood, almost always contains a greater or smaller proportion of gold, which usually gives to the marc of the alloy a value of nine and a half to ten dollars, while silver of the common degree of fineness is paid by the mint of the State, at the rate of eight to eight and a half dollars for 1 marc or 8 ounces. Under a certain ratio, which is rather high there, the separation of gold and silver does not pay.

Jesus Maria.—This famous mining place is a town in the Sierra Madre, on the head waters of the Rio Mayo, and near the frontier of the State of Sonora. Immense wealth was extracted from the numerous mines in its neighbor-

hood at the time of the Spaniards. Its silver ores always contain gold in a ratio to make the marc worth ten dollars. The mine called *Santa Ludubigen* has been worked since the expulsion of the Spaniards. In the six months from May to October, 1839, it yielded a net profit of $400,000, and in the two years 1845 and '46, again $500,000 were cleared by the concern. The chief mine of Jesus Maria, however, which is the *Santa Juliana*, has never been worked since the time of the former masters of the country. This mine is 300 varas (278 yards) deep, and is now filled with water. According to a reliable calculation, $200,000 would be necessary to begin working it again, on as large a scale as would correspond to its importance. The ores have proved never to contain less than 3 marcs or 24 ounces of silver, and have even reached 40 marcs or 320 ounces in one carga, which is 300 lbs., the marc, by its quantity of gold, being worth 10 dollars here, as already mentioned. To clear this mine of its water, a steam-engine would be necessary, and it may be observed in this respect that there is no want of wood for fuel at Jesus Maria, all the mountains of the Sierra Madre being covered with timber. How profitable the mines of this place could be made, if worked with all the means of advanced art, may be seen from the fact that numerous persons of the "gambusinos," make a living, and other persons who provide them with small funds, even make money, by a minute part of the treasures which they contain. Some gentlemen living at Jesus Maria, lend money to the miners under the condition of being repaid, after the time of one month, in bullion at a price 16 per cent. lower than the mint of Chihuahua is paying. One gentleman, investing a capital of 20,000 dollars in this kind of speculation, fully doubled it in one year. And the mint of Chihuahua, paying 16 per cent. more than the miner receives, pays nevertheless about 20 per cent. less than the silver is really worth, having besides the advantage of 1 month's interest by retaining the silver alloyed with gold, that time for the purpose of the separation.

At a distance of 12 leagues from Jesus Maria, a very rich mine was discovered some years ago. This is the mine of

Pertenencia.—The ores of this place have been found to contain from 3 upwards to 120 marcs of silver in each carga, or 300 lbs. The average ratio proved to be 8 marcs. For a certain length of time 300 cargas were extracted every week, containing 2,400 marcs of silver, corresponding to a value of 24,000 dollars per week. The expenses of mining for that quantity of ores were 600—those of extracting the silver from the ores 3,000—total expenses 3,600 dollars. These, subtracted from the above produce, left a net profit of $21,400 per week.

Were it the purpose of these notes to exhaust the subject, a great number of other mines in the neighborhood of Jesus Maria might be named. This, however, would not add a corresponding share of interest to our statements, and it is thought more proper to draw the attention of the reader only to the more prominent facts concerning the mineral wealth of this country.

Corralitos.—This mining place is situated in the northern part of the State, on the Rio de las Casas Grandes, which flowing in a northern direction towards the Rio Gila, but not reaching that river, empties into the Laguna de Guzman. The place is distant from the capital of the State about 90 leagues. The silver here, too, is alloyed with a certain proportion of gold, which, however, appears to be smaller than in the ores of Jesus Maria, the marc being worth here but 9½ dollars. Two mines have been worked at Corralitos, of which the one has been bought, some years ago, by the present owner, for the sum of 40,000 dollars. At that time it has yielded 1,000 marcs every month. The monthly expenses amounted to 4,000 dollars, and a monthly net profit of $5,500 was obtained in that manner. How it continued since that time we have not been informed. But the nature of the mine would allow an increase of its produce to four times the amount just mentioned. Some difficulties however exist. Corralitos is one of the places most exposed to the depredations of the Apache Indians, who live in the neighboring mountains. These savages, by stealing

horses, mules and cattle, and making the road between Corralitus and the capital unsafe in a high degree, contribute a good deal to the very high price which nearly all the necessities of life bear there.

South of Jesus Maria is an extensive district of the Sierra Madre, in which hundreds of very rich silver mines are scattered around. It is situated at the head-waters of the Rio del Fuerte, a tributary of the Gulf of California. The most prominent place of this district is the town of *Batos ágachic* (likewise spelled Batoségachic) where the Government of the State has placed an assayer's office.

Coming from the capital, the first place of this district is *Yuquivo*. Here are several rich mines, and metallic veins which till now have never been worked. The silver contains a fine proportion of gold. Even of the mines which formerly have been worked, none are at the present moment. Some silver, however, is occasionally collected by the poor people of the place.

Batoseágachic itself is more in the interior of the Sierra Madre, and very near "*tierra caliente*," or low hot country of Sonora and Sinaloa. Its distance from the city of Chihuahua is about 110 leagues. Several hundred mines exist in the neighborhood of the town, and many others at different distances, to that of 20 leagues. Some of them are entirely on the surface, and many of them entirely untouched.

Of those near the town, the following are worked at the present moment: *Sangre de Cristo.* The ores contain 4½ marcs of silver in the "*bulto*" of three cargas, that is to say, in 900 lbs. *Carmen*, very profitable for the easy extraction of the ores, one single cartman being able to furnish 100 cargas per week, of which every carga gives a net profit of $2 50. The ores, on an average, contain 15 ounces of silver in the bulto of 3 cargas, the expenses being from $3 to $8 per bulto. *Santa Rita* ores contain from 2 up to 24 marcs per carga. At the depth of 70 varas they had reached the highest proportion where the mine was drowned. A tunnel (*tiro*) was begun for the purpose of drawing off the water, but we cannot tell whether it has been finished or not. *Uruapa.*—This mine is not deemed very rich ; yet the owner, Don Martin Salido, a man who began his mining operations without any capital, selling his silver at the low price of $7 per marc to those who provided him with the first funds, is now worth $60,000, and has refused an offer of $100,000 for his mine. *Palmarejo*, a mine worked on a small scale by its owner, Mr. Urrea, yields him a net revenue of $25,000 a year. This produce, however, could be raised to a much higher amount by different means, among which would be to use a fine water power in the neighborhood, at a place called *Chinipas.*

More at a distance from Batoseágachic are the following:

Setentrion, ten leagues distant, situated on a little river. This mine is the property of Messrs Isidoro de la Torre & Co., of Mazatlan, who have two-thirds, and Mr. Arriola, who has one-third of the concern. The quantity of silver deposited here appears to be extraordinary. The vein is twenty-five to thirty varas thick, continues for miles, and the mining operations can be carried on nearly at the surface. The ores have been proved to contain from three ounces to five marcs in the carga ; but even the poorest of them yield a net profit of $5 50 to the bulto of three cargas, the mining expenses being so little. The owners calculate to extract five hundred cargas every day, but the circumstances of the situation would allow of thousands of cargas being daily extracted. There is, however, one great difficulty at this place—the want of hands—the population of its neighborhood being almost exclusively composed of Tarumare Indians, a mild and honest race, but not well fit for the serious and regular labor in a mine. The scanty and scattered population of the State of Chihuahua in general, makes it difficult to provide for this want.

Cerocáhui, eight leagues from Setentrion, and twelve leagues from Batoseágachic. The silver of this place, too, contains a considerable proportion of gold. The population is composed chiefly of Tarumare Indians, but in many other respects this place promises great success. Water power is near, and beautiful

pine forests cover the neighboring mountains. But till now no regular mining operations have ever been tried at this place.

Urique, 20 leagues from Batoseágachic, passing Cerocáhui. Here the silver ores, which contain over 12 marcs in the carga, are mixed with lead. The last owner of the chief mine, a European Spaniard, returned to his own country with an immense fortune. Since that time the mine has filled with water. A tunnel, for the purpose of giving it an outlet, 200 varas below the mouth of the shaft, was begun some time ago, but does not appear to have been finished. It is calculated that $10,000 would bring the mine again into its old state of prosperity.

Monterde, 20 leagues from Batoseágachic, and 90 leagues from the capital of the State. These mines were not discovered till 1841, and have not yet been regularly worked, though a number of "gambusinos" make a living here. The place is very much away from all communications, and the necessaries of life bear a very high price there.

Batopilas, somewhat above 20 leagues southeast from Batoseágachic, and 110 leagues south-west from the city of Chihuahua, going by the way of Yuquivo. The ores of this place are *native silver*, in a state of purity which makes them fit for immediate sale. In the Spanish times the owner of one of these mines had made such a fortune that he presented the King of Spain with a very great sum of money, and was recompensed by being presented with the title and possession of a marquisate. Since the expulsion of the Spaniards all these mines have been abandoned. Most of them have been shut up with rocks by the inhabitants who occasionally take some silver out of them. A capital of $100,000 is deemed necessary to take up again mining operations on a large scale here. There is a fine little river at this place, affording all the water power which could be wanted.

The south-western corner of the State, bordering on the State of Sinaloa, has two rich mining places. They are:

Morelos, situated 25 leagues south of Batopilas, and 120 leagues south-southwest of Chihuahua. The ores are native silver, very rich where they occur, but of infrequent occurrence. In the hall of the legislative assembly of Chihuahua is *one* piece of silver from this place worth 1,800 dollars. Since the time of the Spaniards no mining has been done here. The rock is hard to work, the place is very much out of communication, and the population is very scanty. These are disadvantages; but there are also great natural advantages at this place. A very fine river affords all the water power which could be desired, and the climate is very warm, which shortens the process of amalgamation in a high degree.

Guadalupey Calvo. This place is situated at the head-water of the Rio de Culiacan. There is one principal mine here which, after having been worked by an English and a Mexican company, is now abandoned. The ores contain from 3 to 9 marcs of silver per carga, the marc, from its alloy of gold, being worth $10, and 600,000 cargas per annum have been extracted. Yet with all this immense produce only 9½ per cent. was gained on the capital invested, which is ascribed to bad management.

At the distance of about 70 leagues south-south-east from the city of Chihuahua, on one of the tributaries of the Rio Conchos, is a mining district whose centre is *El Parral.* The number of mines around that place is very great. The district has peculiar advantages. The country is fertile, the population more dense, and labor cheaper than in any other of the mining districts of the State. The ores of these mines are of two different classes, some of them being fit for cupellation, others for amalgamation. The latter are poorer, but, as the process is cheaper, they are nevertheless the more profitable.

El Parral itself is a place of 7,000 to 8,000 inhabitants. Two different mines are to be mentioned here: *San Fransisco del Oro*, and *La Cruz.* The ores of the first contain 2 marcs of silver in the carga of those fit for cupellation, and 2 to 2½ marcs in the bulto of four cargas of those fit for amalgamation. The latter are the more frequent. In the second mine, which is

worked at the present moment, the ores of the first class have 12 to 13 ounces in the carga, and those of the second class 16 to 18 ounces in the bulto of 4 cargas. The process of amalgamation, as it is conducted here, takes 8 or 10 days.

Ydalgo.—At this place, which is 3 leagues distant from the *Parral*, a great number of mines exist; they are, however, all filled with water, with the single exception of *La Cabadeña*. In this the cupellation ores contain from 3 to 3½ marcs in the carga, the amalgamation ores from 2½ to 3½ in the bulto of 4 cargas. As to the other mines of this place, they are all provided with tunnels, by which, with small expense, the water could be made to flow out.

San Diego.—Among the mines of this place, which is situated at 2 leagues distance from the *Parral*, the more important are *El Nopal*, *La Veta Grande*, *La Honda*, *La Francesiña*, *La Quebradilla*, and *Terrenates*. Their ores, which occur in very considerable quantities, contain 16 to 20 ounces in the carga, when fit for cupellation, and the same quantity in the bulto of 4 cargas, when fit for amalgamation. All these mines are free from water, but all of them are worked only by "gambusinos."

After all these statements, we have finally to speak of the mines of *Santa Eulalia*, which, though their ores are of the poorest, yet, by the immense quantity in which they occur, have been the richest source of wealth in this State.

Santa Eulalia, a little town of 1,500 inhabitants, surrounded by several hundred mines, is only 5 leagues distant from the city of Chihuahua, where, ever since 1703, the ores have been transported for their metallurgical treatment, the situation of the mines themselves being rather unfavorable for that purpose. By the immense wealth thus concentrated at Chihuahua, the population of this city, now reduced to 12,000 inhabitants, was raised, at the time of the most prosperous state of the mines of Santa Eulalia, to the number of 76,000.

In a space of 2 square leagues, all the mountains of Santa Eulalia contain silver. More than 200 mines have been worked in these confines, and there are more than fifty of them which have been sunk to the depth of 200 yards. Some of them are so extensive that one whole day will not be sufficient to see all the different parts of one single mine.

In respect to the immense amount of silver extracted from the mines of Santa Eulalia, the following statements will be found interesting. At the most flourishing time a contribution was raised of *two grains of silver* from every marc extracted, for the purpose of building two churches—one at the city of Chihuahua, the other at Santa Eulalia. They were built in a few years. The cost of that of Chihuahua was $600,000, of that of Santa Eulalia $150,000, and a surplus of $150,000 of the money collected in this manner remained. The result of the contribution, therefore, amounted to $900,000, which corresponds to an amount of 14,500,000 of marcs of silver, worth, at the real value of that metal, $145,000,000, *extracted from the mines of Santa Eulalia in the course of a few years.*

It cannot be supposed that the produce of these mines, rich as they have been to the last moment of the operations, which suddenly were stopped by the expulsion of the Spaniards, should have kept the same ratio at all periods. However, the whole amount of silver which they have yielded, though it is to be divided by a number of about 130 years, will be found very great. In the year 1833 a census of this whole amount was made, and it was found to have been 43,000,000 of marcs of silver, or $430,000,000.

Since the interruption of the regular mining operations, in 1833, the inhabitants of Santa Eulalia have nevertheless almost entirely existed upon the produce of that kind of unscientific and disconnected proceedings which are carried on in nearly all the abandoned mines of this country. In this manner these mines have continued to support a population of 1,400 souls in the little town, and have cotributed a great deal to the support of a surrounding scattered population, which supplies the miners with wood, coal, provisions, &c.

The ores of Santa Eulalia generally contain not much above 4 ounces of silver in the carga. Two of the mines, indeed, which are *Guadalupe* and *Gal-*

deana, have richer ores, containing from one to three and even four marcs. The mines called *Santo Domingo* and *Santa Gertrudis* contain ores chiefly composed of lead. These ores are called *plomosas* or *ayudas*, and as lead is a substance indispensable in the process of cupellation, it is of interest to know that at Santa Eulalia the carga of this class of ores may be had at the cost of half a dollar.

DEPOSITING ALLOYS OF METALS.

In Vol. 1, No. 2, p. 184 of the "Mining Magazine," this process with its beautiful results, was noticed. We now present the details of it, as described in the specification granted to Messrs. Morris & Johnson of Birmingham, England:

This invention consists in the employment of solutions composed of cyanide of potassium and carbonate of ammonia, to which are added cyanides, carbonates, and other compounds of metals, in proportions according to the amount of deposit required to be made.

In order that the invention may be fully understood and carried into effect, the patentees proceed to describe the means pursued by them as follows:—These improvements consist in the employment of solutions composed of carbonate of ammonia (the carbonate of ammonia of commerce or the sesqui-carbonate of ammonia of chemists) and cyanide of potassium, to which are added carbonates, cyanides, or other compounds of metals, in various proportions. For the well-known alloy, brass, carbonate of ammonia and cyanide of potassium are used in the following proportions:—viz., to each or every gallon of water are added 1 lb. of carbonate of ammonia, 1 lb. of cyanide of potassium, 2 ozs. of cyanide of copper and 1 oz. of cyanide of zinc: these proportions may be varied to a considerable extent. Or the patentees take the before-named solution of carbonate of ammonia and cyanide of potassium, in the proportion of 1 lb. of each to one gallon of water; and they take a large sheet of brass of the desired quality, and make it the anode or positive electrode, in the aforesaid solution, of a powerful galvanic battery or magneto-electric machine, and a small piece of metal, and make it the cathode or negative electrode, from which hydrogen must be freely evolved. This operation is continued till the solution has taken up a sufficient quantity of the brass to produce a reguline deposit. The solution may be used cold; but it is desirable, in many cases, to heat it (according to the nature of the article or articles to be deposited upon) up to 212° Fahr. For wrought or fancy work, about 150° Fahr. will give excellent results. The galvanic battery, or magneto-electric machine, must be capable of evolving hydrogen freely from the cathode or negative electrode, or article attached thereto. It is preferred to have a large anode or positive electrode, as this favors the evolution of hydrogen. The article or articles, treated as before described, will immediately become coated with brass: by continuing the process any desirable thickness may be obtained. Should the copper have a tendency to come down in a greater proportion than is desired, which may be known by the deposit assuming too red an appearance, it is corrected by the addition of carbonate of ammonia, or by a reduction of temperature, when the solution is heated. Should the zinc have a tendency to come down in too great a proportion, which may be seen by the deposit being too pale in its appearance, this is corrected by the addition of cyanide of potassium, or by an increase of temperature.

The alloy, German silver, is deposited by means of a solution consisting of carbonate of ammonia and cyanide of potassium (in the proportions previously given for the brass), and cyanides or other compounds of nickel, copper, and zinc, in the requisite proportions to constitute German silver: it is, however, preferred to make the solution by means of the galvanic battery or magneto-electric machine, as above described for brass. Should the copper of the German silver come down in too great a proportion, this is corrected by adding carbonate of ammonia, which brings down the zinc more freely; and should it

be necessary to bring down the copper in greater quantity, cyanide of potassium is added—such treatment being similar to that of the brass before described.

The solutions for the alloys of gold, silver, and other alloys of metals, are made in the same maner as above stated, by employing anodes of the alloy or alloys to be deposited or, by adding to the solutions the carbonates, cyanides, or other compounds, in the proportions forming the various alloys; always using, in depositing, an anode of the required alloy. These solutions are subject to the same treatment and control as those of the brass and German silver before described.

The patentees claim the combination of the carbonate of ammonia, before named, or other carbonates of ammonia and cyanide of potassium, as the ingredients for their solutions for depositing alloys of metals.

SILVERING ALL SORTS OF METALS AND GLASS.

(Patented in England by James Power, *of Paris.)*

The patentee's process is performed as follows:—He takes 1 oz. of crystallised nitrate of silver, dissolves it in twice its weight of distilled water, and adds 9½ per cent. by weight of nitrate and liquid ammonia. He then adds six times the weight of the nitrate of silver, of spirits of wine, agitates the liquid, and adds 15 per cent. on the whole volume of resinous spirit (composed of one part of resinous matter by preference, gum galbanum, to five parts of spirits of wine). The liquid is then left to settle, and filtered, after which it has added to it nine times its quantity of spirits of wine, with the further introduction of 8 per cent. of liquid ammonia, and a quantity of spirits of wine equal to its whole volume. The solution will then contain about 5 parts nitrate of silver to 1,000 parts of liquid. The liquid thus prepared and filtered may be used immediately in connection with a galvanic battery, in the manner usually practised by platers, but it is better to let it remain quiescent for some time. The anode or thin sheet of silver in connection with the positive pole acts perfectly in this liquid, and gradually dissolves in the bath; the desposition commences immediately on the objects to be plated, being introduced into the bath, in a white and brilliant form, and the thickness of coating can be regulated at pleasure. To insure its more perfect adhesion, in certain cases the metal may be first passed through a solution of nitrate of mercury. When glass is the material to be coated, a thin film of silver is previously formed on it, by adding to the liquid a few drops of spirits of cloves in a separate bath, and the quantity of ammonia used in preparing the bath is only from 2 to 8 per cent. By precipitating copper on the silvered glass, and then detaching the two metals, plates may be produced suitable for daguerreotypic or photographic purposes.

Claim.—The silvering of all metals and glass by the aid of certain compounds, and especially resinous matters combined with the use of metallic salts, and put into contact with galvanic or electric action in the usual way; the use of all resins, resinous gums, resinous fluids and balms, and all resinous matters or compounds whatsoever; and further, the production of electro-chemical plates of a single casting upon glass, crystal, porcelain, and all other earthy or other substances not metallic, susceptible of receiving a perfect polish.

PLUMBIC ZINC—A NEW COMBINATION OF METALS.

Messrs. Morewood and Rogers, of Upper Thames street, have recently patented a combination of lead and zinc, under the name of "plumbic zinc." It consists of distinct layers of each metal, perfectly united in a peculiar process of manufacture—one side thus presenting a surface of pure lead, the other pure zinc, combining the stiffness of the latter with the durability of the former. A sheet of metal is thus produced, which proves as hard and durable as one of lead several times its thickness and weight; while in peculiar situations the zinc is laid undermost, and is thus protected from atmospheric actions, or the

effect of acid vapors or liquors, by the preservative power of the lead. For every description of roofing, hips, and ridges, gutters, pipes, cisterns, sinks, &c., this metal will most probably be found highly advantageous. For covering terraces, balconies, stairs, and passages, it will be found similar to lead under the feet; while the stiff lining of zinc will prevent it from treading out of shape. For chimney-tops, cowls, &c., the lead is placed inside, which is indestructible from the sulphurous acids and vapors usually contained in smoke. For coal-boxes, baths, pails, and many other domestic utensils, it will also be found highly useful. Japan will adhere to it as well as to iron plate. It will solder as effectually as tin plate, and works softer and with greater facility than sheet zinc alone. It is also recommended for lining tunnels, sheathing ships, &c.; and no doubt numerous other uses will yet be found for it. We understand the government authorities at Melbourne have contracted for a given period to secure the entire quantity which may be exported to Victoria for flooring and roofing many of the public and private buildings erected in that city.—*London Mining Journal.*

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1858.

Amount shipped from Richmond, Pa., to the close of the week ending Sept. 10th,	794,338	tons.
To same time last year,	917,549	"
Decrease,	123,211	"
Amount sent by railroad to the close of the week ending Sept. 17th,	1,161,864 18	"
Amount by Schuylkill Canal,	582,541 11	"
Total by railroad and canal,	1,744,406 04	"
To same period last year,	1,801,685 07	"
Decrease so far this year,	57,279 03	"
Amount of Lehigh Coal trade to the close of the week ending Sept. 10th,	657,521 14	"
Last year up to same time,	743,778 13	"
Decrease this year,	86,256 19	"

CUMBERLAND COAL TRADE.

Amount sent from Cumberland mines for the week ending Sept. 10th,	12,180	tons.
Total for the year,	310,123	"

PRICE OF ANTHRACITE COAL.

Respecting the price of coal, we find the following remarks in the Pottsville *Miner's Journal*, expressive of the views entertained in the coal region and the embarrassments at the mines:—

On the 1st of October the rates of toll and transportation on canal and railroad will be again advanced ten cents per ton.

Boats are plenty by canal, and the railroad has facilities for transporting more coal, but it cannot be mined, not for the want of working collieries, but owing to the want of hands who will work regularly. The Sunday tippling rum-holes keep a large number of hands from work a portion of the week; many of whom keep up "blue Monday" until Wednesday, and some the whole week, particularly after pay-day. At one point in Cass township, we were informed that no less than seven persons were lying dead at one time, whose deaths had been caused by *rum and exposure.* The picking up of dead bodies in the by-

ways in some sections of the region, is almost a daily occurrence, where they laid down and died more like cattle, than human beings—verdict—"died by intemperance and exposure."

Dealers abroad will have discovered by this time that the pledges we gave to the public during the season, that the price of coal could not, under any circumstances, fall, but must rise, is being verified even to a greater extent than we anticipated ourselves. Coal will, in all probability, be higher the ensuing winter, at points where supplies cannot be furnished in the winter season, than it has been for many years.

FREIGHT OF COAL FROM NOVA SCOTIA.

The *Eastern Chronicle* says a larger amount of coal has been shipped from Nova Scotia the present season, up to this date, than has been in the corresponding portion of any season for some years past. Freights have ranged higher than for the previous two years, and vessels engaged in the trade have been doing a profitable business. Freights are at present as follows:

For Boston (below Bridges),	per chaldron,		$2 75	
New York, . . .	"	"	4 00	mines measure.
Providence, . . .	"	"	3 25	custom-house "
Newburyport, . . .	"	"	2 75 *a* 3 00	" " "
Portsmouth, . . .	"	"	2 65 *a* 2 70	" " "
Philadelphia, . . .	per ton,		2 50 on $3	per chaldron "

There are at present about fifty vessels in that port, all of which were chartered previous to, or immediately on their arrival. The above rates are somewhat higher than were given during the months of June and July, and there is prospect of a still further rise, from the increasing demand for coal and the comparative scarcity of vessels.

NEW CREEK COAL PROPERTY.

[*Report of the Directors to the Stockholders of the New Creek Company, of Hampshire Co., Virginia.*]

The present Board of Directors was organized in July, 1852, at the time the lands of the Company were in a state of nature, and nothing had been done towards putting the company into actual operation. The Board immediately took active measures towards opening the collieries and making the necessary preparations to place their coal upon the market for sale. After mature consideration and examination, it was decided to open the six-feet vein, as we were of the opinion that the coal from that vein would prove to be of a superior quality for all purposes to which Cumberland coal is applied. The result has fully justified our expectations, as we have received very satisfactory assurances of the good quality of our coal from engineers, manufacturers, and dealers in coal in Baltimore, Philadelphia, and New-York, where our coal has been introduced.

In addition, we have opened other veins, lying above the *six-feet* vein, including the big or *fourteen-feet* vein. This latter works fourteen feet of good quality. All these veins are capable of being worked at any time when the trade and transportation shall demand it with a moderate expenditure.

We have all the veins known in the whole Cumberland region, and so situated as to have a natural drainage, not requiring the use of machinery to free the mines from water.

Iron ore, fire-clay, and lime, have been discovered in great abundance upon our lands, and we believe that iron may be made there to very great advantage, and thus furnish us with a large home market for our coal. Measures will be taken by the Board to induce parties to enter into the enterprise.

Our present collieries are capable of delivering 400 tons per day, (the coal now on sale in the Baltimore and New-York markets) and their capacity could be readily increased to 800 tons per day. Our load-house and sideling of 900

feet, are situated beside, and within fourteen feet of the Baltimore and Ohio Railroad, and our branch railroad of three-quarters of a mile in length, connecting the load-house with the mines, has been completed several months since, and all is now in complete order for business, and in daily use for sending our coal to market. There are several other locations on the lands of our Company convenient to the Baltimore and Ohio Railroad, where additional collieries may be opened at a moderate expense whenever it may be necessary for us to do so. In fact, our capacities to mine coal may be considered almost unlimited whenever the market requires it; and the necessary arrangements are completed to furnish transportation. As respects the important matter of transportation, we take this opportunity to correct an erroneous impression which has been made upon the minds of some of our stockholders, by a publication recently made in some of our city papers relating to the allotment of cars for the use of various companies by the Baltimore and Ohio Railroad Company. In that publication, which purported to give the allotment, no mention was made of the New Creek Company, thus conveying the impression that we were without any means of transportation whatever We do not know by whose authority that publication was made, and it may have been intended to state merely the allotment to the various companies operating in Maryland, and our Company being located on the Virginia side of the Potomac, of course was not included. We would state for the information of the stockholders, that when an allotment of cars was made by the Baltimore and Ohio Railroad Company, for the Westernport region, we were furnished with an equal proportion of the cars, and since then we have been furnished with an additional number.

We would call the attention of the stockholders of our Company, to the very great advantages we possess in the location of our lands. At present, the Baltimore and Ohio Railroad passes through a portion of our lands, including our town of Mount Carbon, or Piedmont. The George's Creek Railroad, which brings down the coal of all the various companies located in the Westernport region, terminates in our town, and there connects with the Baltimore and Ohio Railroad. The Alexandria, Loudon, and Hampshire, and the Manasses Gap Railroads will also pass through our lands and with a terminus in our town, so that whatever may be the present facilities of transportation, it is very evident that they will be very greatly increased, and at no distant day; and we shall be prepared to avail ourselves of the various facilities which will then be opened to us, and shall and do now possess the great advantage, owing to our location, of not being required to pay tolls on any branch road before reaching the main avenues to market. We have disposed of a few of our lots in the town of Mount Carbon, or Piedmont, at prices from $250 to $500 per lot, of 25 by a 100 feet, according to location; and have leased others at an annual rent of $30 each. From this source we confidently expect the Company will realize a large amount of money eventually. Shortly after our Board was organized, our attention was called to the necessity of making timely arrangements to procure the necessary facilities for shipping our coal at Baltimore, and we accordingly purchased at Locust Point, two blocks of ground, having a water front of 24 feet by 400 feet in depth, and recently we purchased one-half the block of ground in the rear of and adjoining the original purchase, which gives us a front on Nicholson street, through which the rails of the Baltimore and Ohio Railroad Company are laid, and which gives us every facility to connect our wharves with the Baltimore and Ohio Railroad. On the property one wharf is built, and the materials are now being prepared to build another, and if necessary, hereafter, a third wharf can be built; thus giving us every facility, with ample room to store coal, or load several vessels at one time. The situation of this property is one of the best in the harbor of Baltimore, and its value must be greatly increased with the increase of the business of that city.

By order of the Board of Directors,

ALFRED ASHFIELD, President.

A. JONES, Secretary, *pro tem.*
New-York, Friday, Sept. 9th, 1853

THE COAL BUSINESS.

We have taken the following extracts from a communication which appeared recently in the *Philadelphia Ledger*, because its views are so sensible as to be worthy of the consideration of those who are engaged in the development of the great coal interests of the country:

In reading the journals of the coal mining districts of Pennsylvania, Maryland and Virginia, I have noticed that a great diversity of opinion exists in regard to the quality of the coal mined and sent to market from those coal-fields, for producing steam, melting iron, and for other purposes. I find there is for this purpose (if I may use the expression) a continuous warfare; the one asserts that the coal of its particular basin is really good, and all others good for nothing, and *vice versa* all through; so that a stranger at a distance would really come to the conclusion that all was bad, or at least doubtful as to their true character; and to such an extent has this warfare of words been carried, that the most serious injury is inflicted upon parties who are owners of coal lands in these regions, by preventing capitalists from making investments in any of them to the extent they would be inclined to do, if these petty jealousies did not exist.

This diversity of opinion, I find, is being made a handle of in the stock market of New-York, and I also find that the daily papers of New-York are falling into the same error as that exhibited in the journals of the coal regions, and it works so as to prejudice capitalists against the purchase of stocks and securities of the various coal companies. It may be there are coal stocks in the New-York market, in the hands of speculators, that are of fictitious value—these are pretty generally known and should be avoided—but, I find this fact, that it is parties interested in speculations of this kind who are the main agents and wire-workers in decrying those that are really valuable and good, to bolster up their own operations.

But this great evil does not only exist in New-York, &c., it extends to the other side of the Atlantic, and creates a warranted distrust in Europe, which prevents the capitalists of the old world from purchasing and working properties in what I consider the most permanent, valuable and profitable (if judiciously made and economically managed) investment that can be selected for this purpose, in the coal-fields of this country east of the Alleghanies—a distrust carried to such an extent by the follies and exaggerations here, that the coal lands of the States are unregarded in Europe as objects of safe investment, however valuable they may intrinsically be. To my knowledge, coal lands may be purchased in Pennsylvania, Maryland and Virginia, for one twentieth part the same quality of coal lands in like marketable positions can be purchased for in England, Wales or Scotland. Coal lands here, in very many instances, double themselves in value, if not every year, at least every two or three years, and yet such valuable lands as these, owing to the exaggerated and conflicting statements made in the papers of this country, are therefore not countenanced by European capitalists.

Having well and impartially weighed this matter, I cannot see any reason why there should be any disputes, especially unwarrantable assertions, and untruths, made use of between the parties interested in the coal regions of Pennsylvania, Maryland and Virginia, to destroy or injure each other's interests. There can be no legitimate reason for this abuse, for there is really a market for all the anthracite, semi-anthracite, bituminous, and semi-bituminous coal, that can be mined and conveyed by the different avenues to the cities of the Atlantic from these several coal-fields.

I have professionally examined the anthracite mines of Pennsylvania, the semi-bituminous of Maryland, the semi-anthracite of Broad Top, as well as the bituminous of the Alleghanies, and I cannot see any cause for dispute or contention between these several regions, and between the parties interested in coal estates in any of them. If the anthracite of Pennsylvania is best for a particular purpose, it will be taken in preference to the Cumberland or other semi-bituminous coal, and if for another purpose, semi-bituminous, semi-anthracite or

bituminous coal is best adapted, it will be used in preference to anthracite, notwithstanding the paper speculations and representations in regard to the quality of either of them. The injurious effects emanating from these representations and misrepresentations do not have any influence upon the dealers and consumers of coal. They will purchase that kind of fuel which will best suit their purpose, without regard to the contradictory statements in the newspapers; but it is severely felt in obtaining the capital required for the development and cheap working of all the coal mines—as it prevents capitalists from using their means to open out and produce the treasures of the coal regions at the cheapest rate, and has now gone so far as to cause a general degree of suspicion, unfavorable to our coal interest in the stock market of Wall-street, New-York, which otherwise, if there was a general good feeling existing between the parties interested in these coal-fields, and plain facts, instead of exaggerated and unfounded statements, set forth, would command any amount of European capital for permanent investments in the anthracite, semi-anthracite, bituminous, and semi-bituminous coal regions of this country east of the Alleghany mountain range. and for constructing avenues for the supply of cheap fuel to the extensive and flourishing country, rich in mineral wealth, especially iron ore, in agriculture, and rich in manufactures, between the Alleghany mountains and the Atlantic Ocean.

The coal is in abundance, and the mining facilities may be increased; but the avenues to market, although extensive, are not sufficient to supply the demand—nor will or can the demand be supplied to the fullest extent, at least not for several years to come. The ratio of increase in the consumption of coal is already very great, and it is continually extending itself into all parts of the country for domestic uses, as well as for river and ocean steam navigation.

In conversation with capitalists of New-York, having English and European funds at command for investment in American securities, I have asked the question why coal proprietors were not chosen for this purpose, and have received this startling fact in reply: How can you expect a foreigner, a party at a distance, to invest in your coal properties, so long as you do not show a confidence in this kind of property yourselves? and that you do not, is plainly and emphatically shown, by the tirade of abuse of one proprietor of coal land against another who adjoins him, as to who has got the best or the worst of the two. A general depreciation is going on from day to day, and a general dissatisfaction and distrust in this kind of property is the result, and will be so, as long as these abuses are continued.

Some of the journals of New-York lend their influence, almost daily, to stigmatize many of the Coal Companies, much to the injury of the community at large, as it embarrasses many of them in their efforts to obtain the necessary funds for a healthful and extensive prosecution of their business, by which means it limits the quantity of fuel brought to market for the supply of all classes of the community, which in case of a long and protracted winter, leaves the supply so small, that the poor, who are the least able to pay, are made to suffer by the advanced rates which take place in consequence thereof.

Reflecting upon the foregoing subject, I have condemned the course pursued by the newspapers in relation thereto. It is wrong—it tends to embarrass a business which is as important to the comfort of the community as that of raising wheat to supply them with bread, pure water to drink, or pure air for them to breathe.

IRON AND ZINC.

MASSACHUSETTS IRON WORKS.

This extensive establishment of Messrs. Hooper & Thatcher, which is located at Hoboken, opposite this city, turns out some very fine and beautiful work for railings for houses, balconies, verandahs, and parks.

The work is a combination of wrought and cast iron. The ornaments are cast directly upon the wrought iron, thus rendering them impervious to mois-

ture and avoiding an opportunity for rust. The work is exceedingly strong, and at the same time it possesses a very light and fanciful appearance. The designs, also, are new and extremely tasteful and elegant. For the purpose for which it is used, there is nothing surpasses the work of this well-known establishment.

IRON MANUFACTURE IN MORRIS COUNTY, NEW JERSEY.

We are indebted for a full and complete history of the iron mines and manufacture of Morris county, N. J., to the New-York Tribune, from which we extract the annexed facts:—

WAGES OF WORKMEN.

In Morris county or on its immediate borders, are some fifty different forges, with about 90 fires. Some of these are on small streams, and good judges say it will be a fair estimate to consider the average amount of stock used and iron produced at all these fires at about three-quarters of those set down to the best works, such as the Powerville and Rockaway; that is, that each of these fires will use annually about 42,000 bushels of charcoal, about 260 tons of ore, and produce about 75 tons of bar iron. As many of these forges produce their iron in blooms for rolling, we cannot speak of this with accuracy, but the stock consumed will be very nearly correct. The amount of charcoal consumed in this county at the present state of the iron business, is more than 3,500,000 bushels, and a little short of 24,000 tons of ore. The ore at the forge costs four dollars a ton, making an aggregate of $96,000.

As for the charcoal, it will be a fair estimate to allow three cords of wood as necessary to make 100 bushels of coal, so that we ascertain that about 11,000 cords of wood are converted into coal per year. This wood, standing, is worth about $1 a cord; the cost of chopping is fifty cents, so that the wood choppers receive $5,500 as their share of the wages. And here it ought to be stated that the chopping is all done late in the winter or early in the spring.

The cost of converting the wood into coal is about $2 per 100 bushels, which operation will annually disburse some $70,000 among laborers as wages. The cost of carting this coal is about $1 per hundred bushels, which disburses some $35,000 in wages.

When a forge is stocked with coal and ore, the general rule is that these must then be converted into iron, whether blooms or bars, for one-fifth of the market value of the iron. That is, if draft iron is worth $70 per ton, the forgemen receive $14 per ton for their wages. If octagon iron, hammered for rolling, is worth $55 per ton, the workmen receive $11. If blooms are worth $44, the workmen receive $9 per ton. In this they are at no expense for repairs, tools, or any thing necessary to keep the works in operation. This is the reward of their labor.

At the four rolling mills at Dover, Rockaway, Powerville and Charlottenburgh, about 4750 of blooms and octagon iron are rolled annually, and as all the forges in the country produce 6,750 tons of iron a year, it will be safe to say that 2,000 tons are finished under the hammer, worth $70 per ton, making the sum of $140,000 for this item. The iron that is rolled, is principally blooms, and reckoning the octagon bars, it will be fair to estimate this kind of iron delivered at the rolling mills at $50 per ton, making the value of 4,750 tons to be $237,500. That is, the draft iron, the blooms and the octagon bars manufactured in the bloomery fires of this county, are worth about $377,500.

If we sum up these items and allow $139,500 for coal delivered, $96,000 for ore delivered, and $75,500 for making the iron, we have $311,000 as the cost of making the iron, which is worth $377,500, leaving $66,500 as the reward of the capital invested in the business, only excepting the cost of repairs, which it is impossible to estimate.

BLAST FURNACES.

The only blast furnace in this county is at Boonton, the seat of very extensive rolling, nail and spike mills. This furnace has proved a very successful venture, as the following statistics will show. When we visited Boonton some weeks ago, the furnace had been in blast 119 weeks, commencing with February 13, 1851. During that time it had consumed 20,995 tons of anthracite coal, valued at $96,477. It smelted 21,728 tons of ore, valued at $56,500. It had used 6,606 tons of limestone, worth $9,200. The number of barrow loads of coal, ore and limestone, wheeled into the furnace during this time was 108,716, which will give some idea of the labor necessary to keep the furnace charged. The product in iron during these 119 weeks was 11,755 tons of pig iron, which is nearly 20 tons a day the whole time. This furnace gave employment to 28 men, whose wages during that time amounted to some $25,500, which is a little more than an average of one dollar a day to each man, counting every day in the week. The pig iron run at this furnace in that time at $25 per ton is worth $293,875—a splendid advance on cost.

ROLLING MILLS.

As for rolling mills, if we include the Charlottenburgh mill, which is on the opposite side of the stream which divides Morris and Passaic, there are five rolling mills in this county, viz. at Dover, Rockaway, Powerville, Boonton, (all on the Rockaway river,) and Charlottenburgh. If we take these in the order named, the following statistics are of interest:

At the Dover works, leased by Mr. Henry McFarlan, and managed by Mr. G. M. Hinchman, from April 1, 1852, to April 1, 1853, the following is the statement:

Octagon bars rolled into rivet rods ⅜ to ¼ inch round, and various sizes of merchant iron	392½ tons.
Boiler rivets made from the above, 785,746 pounds, a little more than	328 tons.
Anthracite coal consumed	1,000 tons.

This octagon iron is worth $55 per ton, making the raw material used worth $21,287½. The coal costs about $4,300. The amount of wages paid is about $11,000 among twenty-five hands, and the product of the whole work may be valued at $50,000.

In addition to the rolling mill and rivet factory, Mr. McFarlan has furnaces for converting Swedes and English iron into steel. The following is the list for the year above specified:

Converted and rolled into spring steel from Swedes and English iron	1,000 tons.
Toe cork, or shoeing steel	32¾ tons.
American bar steel	16 tons.

The Rockaway rolling mills, owned in part and managed by Mr. Freeman Wood, are now in a state to be driven without hindrance the whole year.

At Powerville, six miles below Rockaway, on the same stream, is the rolling mill of Mr. Thomas C. Willis, an establishment which is conducted with admirable economy, and yields a rich income.

The Boonton iron works are a great curiosity, and well repay a visit. The rolling mill and puddling furnaces must cover more than an acre of ground, exclusive of the large nail and spike factory, and the coopering mill.

The following statistics of the mills will show the amount of material and labor employed, and the great outlays necessary to keep the business in motion. The statistics reach from October 1st, 1852, to May 1st, 1853, a period of seven months:

Pig iron puddled 3774 tons, nail plate rolled 3009 tons, spike rods rolled 885 tons, scrap iron used 784 tons, ore used in the puddling furnaces 1000 tons, and the anthracite coal consumed 5656 tons. The amount of wages disbursed is about $36,600.

The actual product of the rolling mill is represented in the nail and spike factories. During the seven months above specified, six spike machines, employing twenty-two men and boys, made 1,874,000 pounds, or 836 tons of railroad spikes. The wages disbursed amount to $5000.

During the same period, seventy-three nail machines, worked by one hundred hands, produced 56,179 casks of nails of two hundred pounds each, making a total of 5617 tons of nails. Total of nails and spikes 6453 tons, which is at the rate of more than 11,000 tons per year. We have no means of accounting for the difference between the amount of nail plates and spike rods rolled in that time, and the amount of nails and spikes made, but conjecture that during the time of low prices, a large amount of plate was rolled but not used until the first of October last, or the company use Scotch and other pig iron to mix with their own. The wages paid during this time in the nail factory, amounted to $20,000.

An important part of the works is the coopering mill for making nail and spike casks. The amount paid out for timber, hoops, &c., for manufacturing casks, was $11,331. The saw mill employs ten men, and their wages for seven months $1300. The cooper shop employs twenty-two hands, whose wages for that period were $3360. About 120,000 casks are made per annum. Wherever ingenuity can fix a machine to save or facilitate labor, it is done.

The whole establishment, including the blast furnace, rolling mill, the spike, nail and cask factory, gives employment to four hundred hands, whose annual wages amount to $120,000, or an average to boys and men of $300 each.

The statistics of the Charlottenburgh rolling mill we are not able to give accurately as separated from the forges of the concern. As much of the heating of the blooms for rolling is done by the escape heat of the forge fires, the amount of anthracite coal used is not great. It will not be far out of the way to say that some fifteen men are employed in this mill, and that 600 tons of finished iron are rolled annually, using 650 tons of blooms, worth $27,000. The finished iron is worth $42,000. The labor to produce this may not be far from $4000, and the extra fuel for the furnace about $1000, leaving a handsome profit to the capitalist.

If we sum up the statistics of these five rolling mills, we have the following aggregate: they furnish constant employment to 500 hands, whose aggregate wages per year are $150,000; they use pig iron, blooms, octagon bars and scrap iron, to the amount of 16,000 tons, worth some $600,000; they produce, in the form of bar iron, hoops, nails, spikes, &c., 13,780 tons, worth, in market $1,000,000; they consume over 9000 tons of anthracite coal, worth nearly $40,000, (if we include the blast furnace at Boonton, about 20,000 tons of coal are used to make iron in Montgomery county, worth, at the mines, $86,000.)

THE MINING AND MANUFACTURE OF IRON IN GREAT BRITAIN AND PENNSYLVANIA, &c.

To the Editor of the Mining Magazine:

Previous to the use of mineral fuel by Dudley, the iron of Britain had for centuries been the chief income of the landed proprietors, in a great part of the counties where the ore existed. The quantity made was, however, limited by the amount of charcoal made within a reasonable distance.

The protector, Cromwell, was partner in works in the Forest of Dean, and encouraged the efforts to improve the manufacture in that royal mineral property.

About the same period bodies of riotous men destroyed the furnaces of Dudley, under the impression that the use of pit coal, coke, would so reduce the price of iron as to ruin all concerned in it. Dudley, however, went on, content when his furnace produced about as much pig iron *monthly*, as one now produces *daily*. It is supposed that the first cast-iron was made for dipping malleable iron swords and edge tools, to give the degree of carbon to constitute steel, the swords of the ancients having been bronze.

The most ancient date found on cast-iron in Britain, is subsequent to the discovery of America. As recently as the reign of Queen Anne, not an iron establishment in Britain, excepting one in Sussex (an ancient seat of trade when charcoal was used, but where there is no coal), could cast the railing around St. Pauls. Not a vestige of iron works is now to be found in that county, or a furnace *slagg;* they have been carried away to be used for making glass bottles. Coke furnaces for pig, and refining it for bar, were used by the iron trade at the time Dr. Franklin made it one of the charges against Britain, that America was prevented by her from making iron. There is a document in Derbyshire in the possession of the Sittswells, which is an agreement made with parties, nearly two hundred years ago, to dig the ore and make the charcoal on their estate, manufacture the pig iron, and deliver it by pack-horses at the river Idle near Bantry, a distance of about 30 miles, all for two guineas, $10 50 per ton. The 50 feet thickness of ironstone strata, containing about 30 courses, was worked (as workings prove) by Romans, Danes and Saxons, by *bell work.*

I come now to the invention which changed the produce of iron in Britain from thousands to hundreds of thousands of tons, annually. Mr. Cort, the managing partner of an anchor factory, &c., near Portsmouth, was the first to notice, about the year 1780, what thousands had for centuries seen done by nature, viz., the partial conversion of cast-iron into malleable in the reverberatory furnaces of foundries. He erected such a furnace with an iron door and aperture in it for puddling the fluid iron. Its operation was successful; a patent was taken out. But Mr. Cort was security for Mr. Jellicoe, a receiver of taxes who failed; and the property and patent of Mr. Cort were forfeited to the government. The patent was on a shelf in the treasury office when Mr. Cort died broken-hearted. My father had been the *first* placed with Mr. Cort, to learn the art; and when manager of the Wingerworth furnaces for himself and brothers, at a meeting of the iron masters who had then begun to make fortunes by Cort's discovery (the Minister Pitt having been convinced that it was good policy to set the trade in its infancy free from the restraints of the patent), my father proposed a subscription for the widow of Mr. Cort and handed to her $7,500, in an hour at Gloucester. About twenty years after this wise liberality of the high *Tory* Minister, Pitt, in 1806, a *tax*, with excisemen to regulate the tapping of blast furnaces, and to see that no pig iron was converted into bar, within two miles of the place where it was made, and other *fetters* upon the manufacture of the "*Parent of Food and Civilizer of Man,*" were proposed by the Whigs then in power. My father, having for landlords the most powerful men on both sides of parliament, and being *known* to six dukes residing around his home, so closely as to cause that district to be called "the Dukery," was chosen at the Yorkshire *iron* meeting, of which he was usually President, their deputy to oppose the tax. A strife occurred among the deputies, as to the mode of proceeding; all, except himself and another, proposed merely to beg off the tax, as—the only use they could make of the few days before the reading of the bill. My father obtained through Lord G. H. Cavendish two weeks' time, and collected documents from the iron works proving that Government was buying *two-fifths* of the iron made, and would gain nothing by the tax. The plate presented him for thus saving the country from a *strike* of the iron *masters,* and a stoppage of the works during the war, is a portion of the family honors which decorate my "shanty" in Pennsylvania.

Thus Britain secured cheap iron, the root of her agriculture and manufactures. *Let us resolve to have it for the States.* It may be considered *wandering*, but I cannot resist here drawing a parallel. By anthracite, white ash and rich ores, pig iron is made as cheaply in this State as in Staffordshire, the leading district for the best puddled iron; at Danville for $13 per ton, Lehigh and Scranton for $14. The anthracite, with fan blast, is a better mill fuel than the Staffordshire coal. The fire-brick of the States is more durable; England has not the earthy oxides of iron, Jersey ore, to wall round or throw into the pud-

dling furnace to decarbonize the pig, saving *time*, *labor*, *fuel*, and making good the usual *waste* of ten per cent. of the pig; in a word, giving America the advantage over England in the manufacture. And as to the value of *labor*, if the make of pig iron at $12 per ton is not proof enough, see the sale of some hundreds of thousands of tons of coal at Pittston at 68 cents per ton, while it is $2.68 at the mines in Staffordshire. I could give dozens of cases of the cost of labor to the contractors of public works, to corroborate and prove that labor for cash is as low as in England. There is a greater demand for laborers at some mines on the Lehigh than at Carbondale (where cash is paid), although they work at the latter place more hours daily than the sun is visible, and although the rate of wages at the Lehigh is *nominally* nearly double.

To begin a month's work before a previous one is paid, is unknown in the iron trade of Britain. Almost every other class of laborers are paid weekly. The least doubt as to punctual pay raises wages *twenty* per cent., and the workman would be the loser *forty* per cent.; but *five* of the forty would ruin the master at Manchester, Leeds, &c. &c. The late member of parliament for Manchester, for whom I acted at the iron works in Wales, stated to me that *two* per cent. disadvantage in machinery or situation, would now ruin any manufacturer in Manchester. How long, then, is Massachusetts, with *twenty* per cent. disadvantage, as compared to the coal districts of the West in fuel, food, materials to convey and goods to return, to manufacture for the West, iron or any similar thing. The forgeman at East Boston pays about 50 cents per day for his house and fuel. It would feed the family in the West or in England; yet the pig iron and coal of Pennsylvania is taken to make bar at Boston, and the bar is brought back. Bars at Liverpool lately cost a cent per lb.; the United States tariff and freight to New-York or New Orleans is half a cent.;—total, with fair profit to merchants, two cents per lb., yet the owners of the mills could supply by rail quarterly, and pay five or six cents, or *four times* the price of Staffordshire, and care not, as they charge the *reckless farmer* accordingly. With this tariff of *three hundred* per cent. in their favor, the iron masters of Pennsylvania, by the book of their Convention in 1849, tell Congress that 20 per cent. tariff to the 30 they have, would set the sixty idle mills to work. Or *one-fifth* of a cent per lb. laid on by Congress would be better for them than *three cents* laid on by others. Hoop iron, &c., cost here 7 cents per lb.; in England 2 cents; only miserable management stopped the mills. We will investigate. BUTLER.

THE VEILLE MONTAIGNE ZINC COMPANY.

The two great zinc paint manufacturing companies in the world, are the Veille Montaigne, of France, and the New Jersey Zinc Company, of New Jersey. These companies produce the beautiful paint called the zinc white, which is so universally admired for its brilliancy and durability. A letter on this subject, dated at Paris, thus states:

I send a package containing all the printed manifestoes of the Veille Montaigne Zinc Company. This company has Le Claire's patent, and is the principal company here. I visited their depot in this city; it is very extensive. They have paid no dividend as yet, but one is shortly expected, and the stock had gone up to about 1400 per share, for 180 paid. They do a large business, which is increasing. The manager told me that the sales last year amounted to 600,070 kilogrammes (or 600 tons of 2000 pounds each). This year they have increased to 3,000,000 kilogrammes (or 3000 tons.) You are aware that they have to convert their ore into a metal before they can obtain the oxide of zinc, or zinc white. Connected with their establishment is a large store full of articles manufactured from zinc. These articles consist of all the articles which are usually made of bronze, such as statuary of all kinds, clock mountings, inkstands, candelabra, fenders, &c. The mines of this company are in Belgium.

This letter shows that the company produced last year 600 tons of zinc, and expect this year to produce 3000 tons; that they have made no dividend to their stockholders; that their stock has advanced from 180 francs to 1400 per share, and that their business is increasing.

QUARRIES AND CLAYS.

NATIONAL OIL STONE.

We have been presented with some beautiful specimens of *Novaculite*, or the fine grained *Oil Stone*, by Z. Dickinson, Esq., the President of the New England Mining and Quarrying Co. An appropriate name is given it—that of the *National Oil Stone*. It is quarried and manufactured at Marquette,—about 150 miles from the Saut. The manufacture of these oil stones, in a few years, will be the most extensive in the world, and must, eventually, drive all else of the kind from market, not excepting the *Turkey* Stone, which has now had its day.

In Foster and Whitney's second report on the geology of the Lake Superior land district, Dec. 19, 1851, page 16, as follows:—

"Along the valley of the Crap, between Jackson Forge and Teal Lake, beds of Novaculite or silicious slate are found interstratified with beds of quartz. It has been already quarried at several points for *Hones*, and there is even now a considerable demand for them. The beds are exceedingly fissile and full of flaws at the surface, so that much of the mass is comparatively worthless, but it is believed that the blocks taken from greater depth and beyond the action of atmospheric agents will be free from these imperfections. Messrs. Smith and Pratt have established a factory for the purpose of sawing these blocks, at the mouth of a small stream near the Marquette landing, and are driving a thrifty business."

Again on page 83 *same* vol.: "The Novaculite, however, of Crap River *is superior* to any article which has fallen under our notice. Not excepting Arkansas, Turkey and Scotch Stone for producing fineness of edge. Engravers will find these Hones almost invaluable."—*Lake Superior Journal.*

PATENTS ISSUED IN MAY.

For an *Improvement in Artificial Stone;* Julius Horning and Ludwig Suess, Union Hill, New Jersey.

Claim.—"We do not claim the use of salt for forming a glass upon pottery wares; but what we do claim is, the mode or process of forming artificial stone, as described; that is to say, we claim the employment of silex, alumina, and salt, mixed and treated substantially in the manner set forth, and in the proportions designated, in the manufacture of artificial stone, meaning by salt, the chloride of sodium, or its equivalent, as set forth in the specification."

MISCELLANIES.

THE WHITE SULPHUR SPRINGS IN VIRGINIA.

There are the Salt Sulphur Springs, in Monroe county, Virginia, 17 miles from the Red Sulphur, 33 from the Blue Sulphur, and 22 from the Sweet Springs.

The White Sulphur, the most celebrated, are situated in Greenbrier county, a few miles west of the great Alleghany, and is watered by Howard's creek, a tributary of Greenbrier river. The valley may be said to extend several miles in a direction from N. E. to S. W., and in or near its centre is an extensive lawn.

A writer who seems to be intimately acquainted with the nature of these mineral waters, has furnished a very complete sketch of them to the *Richmond Enquirer*, from which we gather the following particulars:—

About one hundred yards west from the dining-house, is the spring. Just around it there is a slight depression of the surface, and at the depth of about six feet the water issues from a stratum of limestone rock. It is a copious stream, discharging probably twenty gallons in a minute. The pool is an octagon, about four feet and a half in diameter, and perhaps four feet deep, inclosed with slabs of freestone.

Mineral waters may be conveniently classed under the three following heads: Stimulants, sedatives, roborants. Under the first will be found the White Sulphur, the Salt Sulphur, and the Blue Sulphur Springs. To the second may be referred the Red Sulphur. In the third are properly placed the Sweet Springs, and the Red Sweet Springs.

As the first step, then, in the guidance of the reader, I take the analysis of Aug. A. Hayes, Esq., of Roxbury, Massachusetts, upon which, I have no doubt, entire reliance may be placed. In the next place, I will give a comparative sketch of the White and Red Sulphur Springs, the latter having been also analyzed by the same gentleman. It will then be seen how these two remarkable waters differ, and how entirely opposite they are in many respects.

ANALYSIS OF WHITE SULPHUR.

This water is colorless and transparent—when agitated it sparkles from the disengagement of air bubbles. Taste hepatic, resembling that of a solution of hydro sulphuric acid in water. Exposed to the atmosphere, the hepatic odor is succeeded by a slight earthy odor. It blackens metals and salts of lead. Compared with pure water, free from air, its specific gravity is 1.0024.

Fifty thousand grains (about seven pints) of this water contain, in solution, 3,633 water grain measures of gaseous matter, or about 1-14 of its volume, consisting of—

Nitrogen gas	1,018
Oxygen gas	103
Carbonic acid	2,444
Hydro-sulphuric acid	68
	3,633

One gallon, or 231 cubic inches of the water contain 16.739-1000 cubic inches of gas, having the proportions of—

Nitrogen gas	4,680
Oxygen gas	498
Carbonic acid	11,290
Hydro-sulphuric acid	271
	16,739

Fifty thousand grains of this water contain 115·735-1000 grains of saline matter consisting of—

Sulphate of lime	67,168
Sulphate of magnesia	30,364
Chloride of magnesium	859
Carbonate of lime	6,060
Organic matter, (dried at 212 deg. F.,)	3,740
Carbonic acid	4,584
Silicates (silica, 1.34, potash 18, soda 66, magnesia, and a trace of oxyde of iron)	2,960
	186,735

Unlike saline sulphuretted waters generally, this water contains a minute proportion of chlorine, only the sulphates of lime or magnesia forming nearly ten-elevenths of the saline matter.

The alkaline gases are also in very small proportion, and seem to be united to the silicious earths, in combination with a peculiar organic matter. The organic matter, in its physical and chemical character, resembles that found in the water of the Red Sulphur Springs, and differs essentially from the organic matter of some thermal waters.

COMPARATIVE ANALYSIS OF THE RED AND WHITE SULPHUR SPRINGS.

White Sulphur.	*Red Sulphur.*
50,000 grains (about seven pints) of this water contain in solution 3,633 water grain measures of	50,000 grains (nearly seven pints) of this water contain, dissolved as gases, water grain measures—

gaseous matter, or about one-fourteenth of its volume, consisting of..			
Nitrogen gas	1,018	Nitrogen gas	1,487
Oxygen gas	108	Oxygen gas	260
Carbonic acid	2,444	Carbonic acid	1,245
Hydro-sulphuric acid	68	Hydro-sulphuric acid	86
	3,633		3,088
50,000 grains of this water contain 115,735 grains of saline matter, consisting of—		50,000 grains of this water afford, of—	
Sulphate of lime	67,168	Silicious and earthy matter	70
Sulphate of magnesia	30,364	Sulphate of soda	3.55
Chloride of magnesia	850	Sulphate of lime	47
Carbonate of lime	6,060	Carbonate of lime	4.50
Organic matter, dried at 212 deg. F.	4,740	Carbonate of magnesia	4.13
Carbonic acid	4,515	Sulphur compound	7.20
Silicates, silica 1.84, potash 18, magnesia and a trace of oxyde of iron	2,690		
	115,781		20.55

An inspection of the above comparative table, exhibits some curious and important facts. First, the whole volume of gas in an equal quantity of water (50,000 grains) of the white exceeds that of the red by 545 grains. Secondly the carbonic gas in the white, is nearly double that of the red. Thirdly, in nitrogen and oxygen the red predominates; and fourthly (what no one would suspect, judging from the sense of smell), there is less sulphuretted hydrogen in the white than the red by nearly one-fourth.

Again: there are in the white 115.735-1000 of saline matter, to 20.55-100 in the red, or five times as much. Included in this amount, however, there is of the peculiar organic matter termed sulphur compound, in the white only 3.740-1000, while in the red there is 7.20-100, or nearly double.

A careful review of these data, will enable us to judge with some accuracy of the probable mode of action of both waters. First, as to the gases:—The most palpable agent, of course, in all sulphur waters, is that which distinctly marks their character, viz: sulphuretted hydrogen, or hydro-sulphuric acid gas. It is known to be the most active of all the gases found in those waters, and as their constitutional effects on the human system in a state of disease, is mainly to be expected from the searching and alterative power of this gas and its combinations, it is essential to understand whether it belongs to the class of stimulants or sedatives. An attempt has been made to characterize it as a "nervine stimulant," and to establish as a fact, that the use of the water fresh from the spring, was in many cases highly deleterious, while the same water, after this noxious gas was suffered to escape, became admirably adapted to those cases.

Is sulphuretted hydrogen a stimulant? Hear the answer:—"Sulphuretted hydrogen is a colorless gas, having the odor of putrid eggs; it is most offensive in small quantity, when a mere trace is present in the air. It is not irritating, but, on the contrary, powerfully narcotic. When set on fire it burns with a blue flame, producing water and sulphurous acid, when the supply of air is abundant, and depositing sulphur when the oxygen is deficient. Mixed with chlorine it is instantly decomposed, with a separation of the whole of the sulphur." (Fowne's Chemistry, p. 161.) Here then is at once an authoritative contradiction of a bold assertion. The agent represented as a stimulant is in fact a powerful sedative, as will more fully appear in the illustrations that follow.

It has been seen by the analysis that this gas in the red sulphur is more abundant, by nearly one-fourth, than in the white. I have never yet seen any intelligent man, who knew any thing of the red sulphur, that did not give it

rank as a sedative. The following quotation from Dr. Moorman admits the less stimulant character of the red:—

The Red Sulphur is the least stimulating of our sulphur waters, and by some is even regarded as a sedative. It is employed with good effect in many cases for which our other sulphur waters are prescribed, and being less exciting than any other, may be successfully used in some cases in which other waters would be contra-indicated.

The increased order of the white sulphur is readily accounted for by the fact already stated by the chemist, that the smaller the quantity of gas there is in the atmosphere the more intense is the smell, while from the same paragraph we learn that when there is a deficiency of oxygen combined with it, it deposits sulphur the more readily. I ask the reader now to look at the comparative analysis of the red and white sulphur waters. He will see that oxygen in the red being more than double that in the white, the gas is retained longer, while the smaller amount of oxygen in the white causes the gas to be deposited in the form of sulphur; and this accounts for the more abundant deposit of sulphur by the white than the red. These are important facts, all proving the falsity of the unfounded theory that has been so confidently propagated.

This valuable medical agent, then, has been wronged, if not slandered. There cannot be a doubt that many try this water annually with whom it disagrees, as may any water when improperly used, and in such a case it is the duty of a candid physician to direct his patient to some other Sulphur Spring, or if he has reason to believe that, from some peculiarity or idiosyncrasy, there is no one of those waters adapted to the case, he should direct him to some other of the great family of springs in this region, or should send him back to the comforts or endearments of home.

In relation to the other gases, it appears that carbonic acid largely predominates. It is this probably that gives the water that brisk, light feeling in the stomach, which is so generally ascribed to it.

Nitrogen gas, of which it also possesses a considerable volume, is believed to possess of itself very little medicinal power, though it is impossible to say how it may act in combination with agents. That it has no stimulant tendency may be inferred from its being found more largely in the Red Sulphur.

We must, therefore, look for the stimulating properties of the White Sulphur and other analogous waters, to something besides the gases, unless, indeed, the carbonic acid, as is highly probable, contributes to that property. But to the presence of a large amount of saline matter is, no doubt, most of all owing its stimulant properties, and to the fact that some of the saline ingredients dissolved in carbonic acid, and in well-balanced proportion with the other gases, act not only on the digestive organs, but are carried directly into the system by the absorbents.

If the premises I have adopted be correct, it follows that relief may be generally expected in the chronic forms of those diseases that will admit of stimulation of the organism. Accordingly, we find that such is in fact the case, as may be seen by inspection of the large class in which they are known to be the most efficient. These are—diseases of the liver, such as enlargement, induration, concretions, jaundice, and other functional aberrations and abnormal conditions, usually the consequences of exposure to miasma and residence in sickly southern localities; constipation, bilious diarrhœa, dyspepsia in some of its forms; neuralgia, proceeding from impaired digestion, hæmorrhoids and dry piles, chlorosis, cutaneous eruptions generally, hysteria, chorea, symptomatic epilepsy, amenorrhœa, chronic rheumatism and gout, anasarca, enlarged spleen, secondary syphilis, gleet, &c.

The use of the water is contra-indicated in affections of the larynx, trachea, and bronchia; in fine, in all irritations of the mucous membrane, whether of the thoracic or abdominal viscera; in phthisis, organic or functional disease of the heart, chronic irritation of the uterus, dysmenorrhœa, menorrhagia, cancer of the uterus, idiopathic epilepsy and paralysis, and all itritations of the brain or spinal marrow.

Those enumerated are only a portion of the diseases that make up the debit and credit account.

RECENT PUBLICATIONS.

A Geological Map of the United States and the British Provinces of North America; with an Explanatory Text, Geological Sections, and Plates of the Fossils which characterize the formations.—By JULES MARCOU. 8vo. pp. 92, and 2x3 ft. Boston: GOULD & LINCOLN.

This is the most recent as well as the most complete geological map of the United States which has yet appeared. The object of the author has been to recapitulate, very concisely, the numerous observations of the geologists who have studied America, and to present, as completely as possible, the results which have been attained in the study of its geological formations. The divisions adopted in the map are those which have been established by M. de Verneuil, and, consequently, Murchison's division of the palæozoic rocks. Hence it can be compared with the map of England, published by Murchison; with that of Germany by Murchison, De Verneuil and D'Archive; with that of Russia and Scandinavia, by Murchison and De Verneuil; and, finally, with that of Bohemia, published by Barronde.

The execution of this map is very neat and tasteful, and it is issued in the best style. On its margins are geological sections from Yorktown to Fort Laramie; and from Lower Canada to Mobile, Alabama. It is a work which all, who take any interest in the geology of the United States, would wish to possess; and we recommend it as extremely valuable, not only in a geological point of view, but as representing very fully the coal and copper regions of the country.

The explanatory text presents a rapid sketch of the geological constitution of North America, and is rich in facts on the subject. It is embellished with several beautiful plates of the fossils which characterize the formations, thus making, with the map, a very complete, clear, and distinct outline of the geology of our country.

The NEW-YORK TRIBUNE, *Daily, Semi-Weekly, and Weekly.*—This excellent newspaper has come to us of late in an entirely new dress, in which it presents a tasteful and business-like aspect, unexcelled by any other daily in the country. There is no paper published in the United States which has so much of the popular element in it, apart from all party distinctions, as the New-York Tribune. Whatever concerns men, as men, whether socially, politically, or religiously, is treated in its columns with that fearlessness, candor, and justice, which its merits deserve. In a country whose institutions are dependent upon the improvement of the citizen, and where principles and views are constantly rising up before the public and claiming attention, a press conducted with such liberality of sentiment as fearlessly to keep just in advance of the times, and give expression to every earnest and serious thought, is an invaluable treasure to the public, and never can be too highly appreciated. The service which this daily has thus rendered to the substantial, industrious, sincere portion of the community, since its commencement, is incalculable. In its literary reputation it is without a superior with the public.

The AMERICAN IRON MANUFACTURERS' JOURNAL, *devoted to the interests of Iron and Hardware Manufacturers, Founders, Engineers, and Contractors, and the Domestic Iron Hardware Trade.* Published every Tuesday, by ROBERT F. BROWER, New-York.

This sheet contains many valuable particulars in relation to the manufacture of iron and its kindred subjects, in addition to an extended report of the metal market. It is a useful auxiliary to this extensive interest.

THE
MINING MAGAZINE.

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

CONTENTS OF NO. V., VOL. I.

ARTICLES.

ART.		PAGE
I.	THE SILVER OF THE LAKE SUPERIOR MINERAL REGION	447
II.	REPORT OF THE LYCOMING IRON AND COAL COMPANY. By PROF. JAMES T. HODGE	455
III.	THE PROPERTY OF THE SHORT MOUNTAIN COAL COMPANY—IN LYKENS VALLEY, PENNSYLVANIA	468
IV.	REPORT ON THE DOLLY HYDE COPPER MINE. By DR. CHARLES JACKSON	476
V.	MODERN GEOLOGY	480
VI.	VIEWS ON AMERICAN MINES AND MINERALS. By CHARLES S. RICHARDSON, CIVIL AND MINING ENGINEER, LONDON AND NEW-YORK	489
VII.	THE BLOW-PIPE, AND ITS USE IN CHEMICAL ANALYSIS NO. 2	496
VIII.	MINERALOGICAL EXHIBITION IN THE CRYSTAL PALACE, NEW-YORK	497

JOURNAL OF MINING LAWS AND REGULATIONS.

Act of the Pennsylvania Legislature on the Incorporation for Mining Companies	499
Mutual Rights of the Owner of the Soil, and the Owner of the Minerals Beneath	502

COMMERCIAL ASPECT OF THE MINING INTEREST.

Mining Stocks in New-York	503
Fluctuations in Mining Stocks at the N. Y. Exchange Board	504
Importations of Coals, Metals, &c., at New-York	504
Mining Stocks in Boston	504
Fluctuations in Mining Stocks at the Boston Exchange Board	506

JOURNAL OF GOLD MINING OPERATIONS.

California Gold Fields	507
Titles to Mines	507
Quartz Mining	507
Flume Operations	508
Stock in Fluming Companies	509
Mining Region of Sonora, Mexico	509
Australian Gold Fields	510
Comparative Yield of the Australian and California Gold Fields	511
Gold in the Amazon	512
The Dorn Mine of South Carolina	513
Gold Mines of North Carolina	513
Virginia Gold Mines	514
Yield of South American Mines	514
Production of Gold by Artificial Means	515

JOURNAL OF COPPER MINING OPERATIONS.

PAGE
Improvements in obtaining Copper and Zinc from their Ores.................... 515
New-York and Michigan Mining Company.................... 515
Statement of the Treasurer of the Forest Mining Company.................... 517
Shawmut Mining Company.................... 517
Norwich Mining Company.................... 518
Montreal Mining Company.................... 520
North Carolina Copper Company.................... 522
Potomac Copper Company.................... 522
Agate Harbor.................... 522

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

Shipments of Lead from Galena.................... 523
Specular Galena.................... 523
Statement of the Ulster Lead Company.................... 523
Missouri Lead Mines.................... 525
Victoria Lead Company.................... 526
Improvements in the Separation of certain Metals from their Ores and Compounds 528
Preparation of Pure Silver from Chloride of Silver.................... 528
Separation of Silver from other Metals.................... 529
Desilverization of Lead by Zinc.................... 530

COALS AND COLLIERIES.

Anthracite Coal Trade.................... 531
The Supply of Coal.................... 532
Cumberland Coal Trade.................... 532
The Llangollen Company.................... 532
The Introduction of Anthracite Fuel.................... 532
The Dorn Coal Company.................... 533
Shafts, Wages, &c.................... 534
Pennsylvania Coal Company.................... 535
Coal Field at the Cape of Good Hope.................... 535
Lamps and Candles in Collieries.................... 536
Report of the Parliamentary Committee on Explosion.................... 536
Separating Coal from Foreign Substances.................... 538
Origin of Coal.................... 539
Principal Coal Fields of the British Islands.................... 540

IRON AND ZINC.

Lake Superior Iron.................... 541
The Forest City Iron Works.................... 542
Iron Ore in Wisconsin.................... 543
Cost of British Pig Iron.................... 543
Galvanized Iron.................... 543
Pennsylvania and Lehigh Zinc Company.................... 544
Improvements in the Manufacture of Iron.................... 546
" " Malleable Iron and other Metals.................... 547
" " Wire.................... 547
" " Furnaces, &c.................... 547
Improved Mode of Heating Air for Blast Furnaces.................... 547
St. George Iron Mines, Savoy.................... 548

QUARRIES AND CLAYS.

Composition of the Earthy Mixtures of English Stoneware.................... 550
Lake Superior Marble.................... 551
Natural and Artificial Marble.................... 551
Knight's Boring Machine.................... 551
Machine for Boring Rock.................... 552

MISCELLANIES.

Products of Prussian Mines.................... 552
Tin in New Hampshire.................... 552
Human Bones in Solid Rock.................... 553
Singular Occurrence in a Mine.................... 554
Seely's Patent Lime Kiln.................... 554
Baker's Improved Steam Boiler Furnace.................... 555

Recent Publications.................... 556

THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. I.—NOVEMBER, 1853.—No. V.

Art. I.—THE SILVER OF THE LAKE SUPERIOR MINERAL REGION.

The existence of silver in the mineral region of Lake Superior has been known for some time. It is found in the metallic state in the copper mines on the South shore, and at the island of Michipicoten on the North shore. It may be said to exist in most of the copper mines on the south shore in a native state, and occurs in specks and small masses both in the veinstone and studding the copper. It is a matter of great mineralogical and geological interest, that the silver is not found in alloy with copper; silver, even when it occurs in the closest adhesion with copper, never presents any traces, of an alloy with the copper. In all cases, on Lake Superior, it has been found near the surface, and indicates what has heretofore universally proved to be true under such circumstances, that the native silver will disappear as the shafts of the mines are sunk deeper, and copper alone occur. A similar fact prevails extensively in our southern gold and copper mines. At the surface the gold is found so abundantly, as to cause many of the mines to be regarded as gold rather than copper mines; but as shafts penetrate to a greater depth, the gold gradually diminishes, and they become genuine copper mines. This fact is well known to occur both with regard to gold and native silver.

This view is in accordance with the statements ascribed to Prof. C. U. Shepard in the following report from a very respectable source: "Prof. Shepard has just returned from a fortnight's exploration in the counties of Mecklenburg, Union, Cabarras, and Rowan, N. C., and states that the prospect of an abundant supply of copper ore is afforded by the indications presented in the mines of those counties. The great metalliferous region known as Gold Hill, in Rowan, and which, next to the famous Dorn Mine in South Carolina, is the most productive deposit of

the precious metal in the United States, is perhaps the most promising repository for copper thus far brought to light. Other places may hereafter prove equally rich; but the gold veins at Gold Hill, being already worked to a depth of nearly three hundred and fifty feet, afford the most favorable opportunity in the country for judging the character of that spot for copper—a metal which rarely shows itself in much richness at the top of the ground. Already, from the depths referred to, tons of merchantable copper ore are daily raised; and the indications are such as to lead the Professor to predict that Gold Hill will very speedily acquire a character for copper as distinguished as that which it has long since established for gold."

The percentage of native silver in the copper mines of the Lake Superior region has never been determined. We speak now of native silver in distinction from any ore of silver such as was recently reported to have been discovered as a companion with the copper of these mines. Of such ore or ores we shall speak presently.

A principal difficulty in determining the probable percentage of native silver occurring with the copper, has arisen from the practice of the miners to secrete valuable specimens which appeared, so that only a small quantity might come into the possession of the owners. Nevertheless, some companies have realized no inconsiderable sums at different times from this source. It is irregularly diffused, and gives no certain indications of its existence. Strictly speaking, no reliance should be placed upon its occurrence in estimating the value of a mine. If it occurs in any quantity it is so far the good fortune of the owners; if it does not occur, the copper mine still remains in which to continue their operations.

Thus far respecting the native silver on the south shore of the Lake; we will next notice that found on the north shore, the locality of which is at the island of Michipicoten, where it occurs extensively. It is very apparent to the eye in miscellaneous specimens taken from the lodes, and assays prove its existence at a large percentage. Nevertheless, analyses made at different periods seem to indicate a decrease of the percentage in this case.

The island of Michipicoten lies about one hundred miles north of the Saut Ste. Marie, on the north coast, or Canadian side of Lake Superior. It is about twenty miles long, from east to west, and from six to nine miles wide, north and south. About the centre of the north side there is a harbor, called North Bay, and directly opposite on the south side another, known as Quebec harbor. This harbor is easy of access, and of sufficient capacity to hold a large number of vessels.

The island resolves itself into three natural divisions of nearly equal size. The eastern and western portions are hilly, with some tracts of fair land. The middle division is, however, generally fertile in its soil, extending from the rear of Quebec harbor through to North Bay, with an average width of three or four miles; it forms a fine valley, separating the two extreme portions of the island, the hills of which overlook it. The valley itself is gently undulating, free from swamps, although watered by several small streams which unite and form a large and rapid creek, emptying into the North Bay. The wood is almost exclusively maple. The hills on the island rise to the height of six hundred feet above the level of the surrounding lake, thus causing the island to present a bold and picturesque appearance. They are generally abrupt, especially on their north side, where they generally present a vertical precipice, often hundreds of feet in height, affording from their tops a view as far as Mamainse Bay in one direction, and Otter Head in the other.

This hilly configuration is composed of feldspar, intersected with or by veins of mica, quartz, &c., in the interstices of which gray ore, and carbonated samples of the same metal are frequently met with; but they have not been found in sufficient quantities to render them of economical value. The composition of the valleys is chiefly igneous matter, such as amygdaloidal trap, trap, ordinary greenstone, &c., &c., which formations are traversed by well-defined veins of pyrites and ferro-calcareous matter.

A report of Capt. O. H. Mathews, formerly superintendent of the mines at Mica Bay, describes the south side of the island as "a scoraceous trap," in appearance very much like the coarse refuse of a smelting furnace; in this no veins are discoverable carrying either copper or silver, whilst the amygdaloidal traps of the north abound in veins. "I have paid," he says, "particular attention to this section of the island, and have taken washings from various places along a line of nearly two miles, and invariably obtained native copper, and often large associations of silver." Another report made by Wharton Metcalfe thus describes this locality:—"The rock here for about two miles, following the indentations of the coast, consists entirely of the greenstone and amygdaloid trap; it is every where intersected by small veins of from one to three inches in width, consisting generally of the spar and laminite, and all carrying either native copper or gray ore, or both; in rear of the beach, at distances of from one hundred to four hundred yards, are perpendicular bluffs; and on closely examining these, I find that the greenstone and amygdaloid trap constitute only about fifty or sixty feet of their height; this is overlaid by a different description of trap rock, in which are no indications of copper whatever." It has been conjectured

that the island is a prolongation of the same trap eruption which formed Point Kewenaw on the south side of the lake, which is so rich in copper. Its resemblance to the Isle Royal is also quite striking.

The metal-bearing veins occur in the recent trap, especially that variety called gray trap, which is abundant. Mr. Metcalfe thus describes the lodes as he found them :

"LODE No. 1.—Is situated in the bottom of the bay, direction, northwest and southeast ; crosses the shore diagonally, is from 6 to 8 inches in width ; walls are most distinctly defined, and consist of amygdaloid trap ; contains native copper and silver in great abundance, in a matrix of fine transparent spar mixed with quartz. The copper presents itself sometimes in masses of several ounces, but is more generally found densely diffused in conjunction with the silver throughout the matrix, the whole in a very crumbling condition, for a depth of about 2½ feet, after which I found the walls and veinstone solid, and the latter so entirely filled with mineral, that no pick or gad could be driven into it ; the water also came in at this depth, so that in blasting the powder had to be inserted in greased paper bags ; by this method I was enabled to obtain some magnificent specimens of the contents of the lode.

"To the east of this vein, at short intervals, are two others of nearly equal dimensions, both carrying native copper and silver, which from their dip must unite with No. 1 at an inconsiderable depth.

"LODE No. 2.—Is in the immediate neighborhood of the place whence large specimens of native copper were obtained ; its course is nearly east and west, and very close to the lake shore ; it is apparently from 7 to 8 feet in width, and carries minute particles of native copper in the matrix of calcareous spar, densely impregnated with red oxide of iron, and constituting that favorable appearance known to miners by the name of gossan.

"It is crossed by four other veins at intervals of from 100 to 150 yards, these veins are nearly from 4 to 8 inches in width, carrying gray ore, native copper, &c. ;—there is one, however, which from its superior size I shall call

"LODE No. 3.—It is from 1 to 8 feet in width ; direction nearly northeast and southwest ; veinstone of a green and brown color, and not very hard, carries native copper and gray ore. A strong vein, a foot wide, runs directly across it near the shore.

"Proceeding west along the coast there are no traces of mineral for 4 or 5 miles ; but on arriving within about 1¼ or 1½ miles of the cave, which is so well known on the west end of the island, you find greenstone and amygdaloid trap ; and in this vicinity I found

"LODE No. 4.—Direction east and west ; is about 6 or 7 feet

wide, underlays into the island, and crosses the shore very obliquely; veinstone of a red or lilac color, compact, but not very hard; shows a few traces of copper on the surface in shape of green carbonate, and on the breaking of the veinstone, gray ore and native copper were perceptible; the walls of this lode are uncommonly well defined, and consist of trap rock, precisely of the same kind found about Mamainse Island.

"A piece of the veinstone reduced to powder, and subjected to repeated washings in a shovel (a process technically called ramming), showed minute particles of silver. To have ascertained more would have involved the sinking of a shaft, as blasting could not be done on the surface, owing to the constant draining of water from under the thick bed of gravel, and boulders heaped over the view upon the shore.

"LODE No. 5.—Runs in front of the cave, where it has a very unpromising appearance; but 200 or 300 yards east, in the greenstone and amygdaloid trap, it changes its character entirely; it is from about 14 inches to 2 feet wide, has well defined walls, and dips into the island; veinstone of various shades of green, brown, and red; hard, and thickly filled with fine particles of native copper; this, however, is also distributed through the vein in small masses, of from ½ an oz. to a lb. weight. I obtained several small casks of specimens from this lode within 2 feet of the surface.

"The course of this lode (in front of the cave) is north and south; but at a short distance from there it appears to increase in size, and runs right into the island.

"LODE No. 6.—Is about 7 or 8 feet in width, has a northeast course, is seen running for some distance through the water, holding a very direct line, and elevated above the adjacent rock on either side of it, so as to enable a person to walk on it in 1 or 2 feet water, whilst on either side of him is a depth of 3 or 4 feet. Consists on the surface of a calcareous gossan, densely associated with red oxide of copper. Copper (native) can only be slightly detected in it; a piece washed in the shovel at Mica Bay showed particles of silver.

"Leaving the cave, I doubled the west end of the island, and coasted along the south shore; here no traces of copper have been, or probably ever will be, observed. I doubled the east end of the island, and closely examined it from there to the North Bay, the name by which I designate the small bay, in which the silver lode is situate, thus completing the circuit of the island; and at about 3 miles from its east extremity, on the north shore, I discovered

"LODE No. 7.—Apparently about 4 feet wide, but one wall is not sufficiently well defined to enable me to speak with precision.

Course northeast and southwest, beautiful specimens of green and and blue carbonates of copper and gray ore on the surface. Native copper can also be perceived in small particles; wall rock, greenstone, and amygdaloid trap is found close by, and the shore is here intersected by numerous veins of laminite spar, &c. &c.

"In addition to these seven lodes, I have observed a number of spar veins west of the cave, some of them very large, and two or three of them carrying gray ore; some of these are perhaps worthy of further examination at a future period; and at the east end of the island are two or three veins of barytes, one of which carries gray ore also."

Under the administration of Lord Elgin, this island was ceded by the Provisional Government of the Canadas to the Quebec Mining Company, to be held by them in perpetuity, free of all claims by way of "Royalty." Mining operations were commenced on a vein bearing N. 50° E., and S. 50° W., which enters the island on the north at North Bay. At the water's edge, this vein is only a few inches in width. A shaft was sunk on the summit of the first elevation of the rock, about 20 feet inland, to the depth of 27 feet, by Captain Higgins, of Cornwall, who obtained a considerable ore, worth, as he stated, £600. Mining operations were however closed in this shaft, in consequence of the entrance of water from the lake. Subsequently, Mr. John Bonner, who had entered the land, commenced a shaft on the same vein about 60 feet further inland than the former shaft. This was sunk by him about sixty feet, and considerable silver obtained.

This mine has more recently become the property of the Lake Superior Silver Company. The entire property of this company embraces 2133 acres of land on the island. It is divided into 100,000 shares at ten dollars, of which about 19,000 are reserved for working capital, and still belong to the company. Their operations are now carried on under the charge of Mr. George K. Smith. A shaft has been sunk to the depth of 60 feet, and an adit has been commenced. The indications afford a very flattering prospect to the proprietors.

A discovery of an ore, of silver in the copper mines on the south shore of the lake, in addition to the metallic silver known to exist there, has just been proclaimed to the public. We will state it in the words of the author, who is a distinguished senator in Congress, from Connecticut, Mr. Truman Smith. In his communication, Mr. Smith thus proceeds: "It is well known to my friends, that I have spent most of the past summer on the lake, actively employed in attending to the interest of several companies in which I am concerned, and particularly the Northeast Mine. On my return from the lake, I brought with me a considerable number of copper specimens, which I have now at my

dwelling-house in Washington. Having been introduced to the gentleman referred to above, I invited an inspection of these specimens, when he immediately pronounced the veinstone or matrix adhering a rich ore of silver. It has been known from the beginning that there was more or less of native silver to be found in the mines. It was at one time believed the quality would be sufficient to bear separation, and would add considerably to the value of the mines; but this has turned out fallacious. But it has not been known, or even suspected until lately, that there is in the matrix of some of the mines, if not all, an ore of silver. When the fact therefore was suggested, I expressed some incredulity. My friend offered, however, if I would furnish the necessary appliances, to extract the silver in my presence. I readily embraced the offer, and the result has been a full verification of the fact. I have with me at the Astor House, specimens of the ore, and also of the silver as extracted. Four parcels were reduced, and the result was as follows, viz.:

"No. 1. From Northwest Mine, yield after the rate of 56 oz. of silver to 100 pounds of ore—equal to 1,120 oz. per ton; value, $1,355 21.

"No. 2. Isle Royale Mine, yield after the rate of 26 oz. to the 100 pounds—equal to 520 oz. per ton; value, $627 20.

"No. 3. From the same mine, yield after the rate of 40 oz. to the 100 pounds—equal to 800 oz. per ton; value, $968.

"No. 4. Cliff Mine, yield after the rate of 12 oz. to the 100 pounds—equal to 240 oz. per ton; value, $290 40."

Upon this statement the "Lake Superior Journal" thus remarks: "The communication recently made by Hon. Truman Smith—which we publish this week—is attracting considerable attention in mining circles. That hundreds and perhaps thousands of tons of rich silver ore have been raised from our copper mines and thrown away as useless, worthless rubbish, is certainly a most wonderful discovery, and one that is calculated to produce no little excitement among those interested in mineral localities and mining stocks. There is no questioning the truth of the statement, extraordinary as it may appear at first view. We have just seen specimens of this ore from the mines mentioned in the list assayed, and they are nothing different from the veinstone found at the mines generally.

"We learn that a specimen from the Norwich Mine, in the Ontonagon District, has recently been assayed with similar results, and we have no doubt but that this silver ore will be found in more or less abundance in connection with the rich copper veins throughout the country. It would appear that like the ores of copper, this silver ore exists in this region in great abundance; and, like the copper, the silver has been produced by that last great

process in Nature's grand smelting works, by which the ore is refined into pure unalloyed metal. This ore has been thus smelted only in small quantities, small specimens being found at nearly all the mines, but not in *masses* like the copper, *as yet*; while the copper ores generally have been reduced to a pure metal on the south shore of Lake Superior. On the north shore, and on the south range of the south shore of the lake, sulphurets of ores of copper are found, which were prepared for the great original smelting establishment, but which were left to be operated upon by the skill, ingenuity, and labor of man.

"At the same point in the process of smelting has this silver ore been left, which now requires to be reduced to pure silver metal by the hand of man. This discovery is likely to be very important in its results, as this ore will require to be smelted in the country."

The theory of the formation of the metalliferous deposits alluded to in the above remarks of the Journal, is undoubtedly erroneous. We shall have occasion to speak of this subject more at length in a future article.

With regard to this new discovery, we have no doubt the analyses spoken of by Mr. Smith may have been correct so far as relate to their results. Silver has been repeatedly obtained by analysis of this veinstone; but whether the silver has been obtained by such analysis from an hitherto unknown ore of silver, or from minute particles of native silver which we know to exist, disseminated in the matrix, is a question which is as yet very far from having been decided.

This ore, which is reported to be discovered, is called a chloride of silver,—on what ground we do not know,—because the analyses spoken of by Mr. Smith, were made only for the purpose of detecting silver in the veinstone without regard to the question whether it was native or an ore; and as we understand, made in such a way (by amalgamation), that it was not possible to determine the existence of a chloride of silver in the veinstone.

From the appearance alone of samples from the mines on the south shore, we doubt the existence of chloride of silver there, and from the appearance of samples of the Michipocoten Mine, we are rather inclined to think that if there is in them an ore, it may be a bromic chloride of silver.

We think we have brought the question to the distinctive point which now remains to be settled. And we have made such preparations, that we hope in the next number of the Mining Magazine to present a complete and satisfactory solution of it.

ART. II.—REPORT OF THE LYCOMING IRON AND COAL COMPANY. BY JAMES T. HODGE, GEOLOGIST.

GENTLEMEN:—The tract, containing 2,000 acres, with six per cent. additional for roads, is situated on the west side of Lycoming Creek, commencing at Frozen Run, twenty-five miles above Williamsport, and extending about two miles up the creek to Red Run. Ralston, for some time the terminus of the railroad from Williamsport (which is now in process of construction to Elmira, New-York), lies in the Lycoming Valley, on the easterly edge of the tract. The railroad at this point is 808 feet above tide-water. On each side, the mountains rise abruptly to the height of nearly 1,000 feet. Frozen Run and Red Run are parallel streams coming in from the west; their sources are two or three miles back in the hills at a high elevation; their beds are deep cuts through the piles of strata that compose these hills. Up the ravines produced by the run are the only roads by which ascent is had to the summit. These roads being laid out at a grade of about a foot to the rod, mule teams can draw up light loads, and bring down four tons, making six trips every day. The summit of the mountains is comparatively smooth. Forests of large maple, beech, and oak, here give evidence of a strong soil, and grass grows spontaneously along the roads. As these lands are cleared, they must become valuable for cultivation. Down the slope of the hills the growth is principally hemlock; in the ravines, and on the brows, and upon the highest ridges, white pine of excellent quality has been abundantly found, and large quantities of this timber have already been sawn into lumber at the mill below the mouth of Frozen Run. The only streams beside the creek that water the tract, are the two runs already named, and their small branches. These runs, by their rapid descent, afford great power for carrying machinery; but this cannot be relied upon the whole of every year. Springs abound upon the mountain, as is common throughout all the coal fields.

Of the 2,000 acres, I shall assume that 300 lie in bottom lands (part of which are cleared), in ravines, and steep mountain slopes. Seventeen hundred acres consist of what I shall call summit lands. The only bottom lands suitable for cultivation are those at, and near the mouth of Frozen Run. Here is a fine farm, with suitable farm-house, stables, and other buildings. The village of Lycoming, formerly called Astonville, which belongs to the Company, extends up Frozen Run towards the charcoal blast furnace, which is about one mile from the railroad. Besides the furnace buildings, there are about twenty houses for

workmen belonging to the company, as also a store, and comfortable agent's house; these have all been put in thorough repair the past spring. On the summit are other houses for the accommodation of the miners.

GEOLOGICAL STRUCTURE.

The hills along this portion of the Lycoming Valley are made up of nearly horizontal piles of strata of different groups of rock.

At the base appear the upper members of the series of red slate and red sandstone, called in the Pennsylvania Reports, Formation No. IX.; they extend but about one hundred feet above the valley at Lycoming. At Ralston, by the gentle northerly slope of the strata, they have almost entirely passed beneath the surface, while a few miles above they again come up by a change of dip. It is this curve in the strata which gives the trough shape to the formations at this point, and causes such a depression along the central or synclinal line of the basin, that the coal measures, the highest strata in Central and Western Pennsylvania, find their place below the summit of the hills.

The next formation of rock above the red shales and sandstone, is a series of hard gray sandstones. This rock generally constitutes the principal part of the eastern or southern slope of the main Alleghany ridge. It is in thin beds, seldom in large blocks; except these, are a collection of the thinner layers. It projects in bold cliffs, and the slaty debris from these cover the sides of the mountain below. It is a convenient stone for building purposes, and very durable. The top of this group is about 480 feet above the village of Lycoming.

The next formation consists of red shales, which contain several beds of iron ore. Its thickness in this part of the State is very near 100 feet. Above it, is the conglomerate and sandstone—the real floor of the coal formation. This rock is only 70 to 80 feet thick, though in some other counties it exceeds 1,000 feet. It is a massive sandstone, composed of white quartz, pebbles and sand. Being exceeding hard and durable, it has withstood better than the other strata the wearing agencies, that have given the present outlines to the hills, and is everywhere the most prominent rock, standing out in precipitous ledges, or capping the ragged summits around the margin of the coal fields. As it is so well marked in its appearance and position, it is the best guide to determine the presence of the coal measures, the next formation above, as also to mark the position of the valuable bed of iron ore, which in this region is found immediately below the conglomerate.

The coal measures occupy the summits along the line of the

basin. They consist of sandstones, shales, fire-clay, beds of coal, and some iron ore in the shales. It is only the lower part of the series, about 120 feet in thickness, that catches in these hills. In Western Pennsylvania, where the formation dips down beneath the surface, the whole thickness of the strata making up the coal measures is several thousand feet. The inclination of these formations being from Frozen Run towards the N. N. W., they are at a lower level on Red Run, and supposing the hills to be equally high, there will be found a greater thickness of the coal formation in this direction. A little beyond Red Run the inclination is reversed, the central line of the basin here crosses the creek, and the conglomerate caps the summits a few miles farther north. The width of the basin does not appear to exceed six miles, and the length of the area occupied by the coal formation before interrupted by the conglomerate, is believed to be about ten miles. Both in length and width, however, there are occasional interruptions caused by the valleys.

From the position, nearly horizontal, of the strata, it will be understood that the lower any one is found in the hills, the more area it will cover, or in other words, the less it will have been cut up and portions of it removed by the process of excavation of the ravines and valleys; the iron ores under the conglomerate are a little more extended than this rock; the coal measures above it occupy a less area, and the upper beds pass only through the highest knobs.

USEFUL MINERALS.

The important minerals are the iron ores, bituminous coal, fire-clay, and building stones. These all occur in layers nearly horizontal, interstratified among the shales and sandstones.

IRON ORES.

In this basin is found a stratum of iron ore, of peculiar quality, in a bed of fire-clay, which immediately underlies the conglomerate. Though I have discovered the same ore at several other localities in the State, in the same position, it is of rare occurrence and is but little known. It is remarkable for making iron of very superior quality, while in its whitish color and stony structure it has more resemblance to a sandstone than to a metallic ore. The fire-clay is a dry shaly material of stony appearance, and bluish gray color; its thickness is about six feet. The bed, where worked in the year 1839, is 790 feet above the railroad at Frozen Run. The ore lies in this, in a solid stratum, varying in thickness from two and a half to five and a half feet. It averages from three and a half to four feet. Fire-clay, two feet thick, usually separates it from the conglomerate, but the clay is very variable, and frequently runs into the body of the

ore bed, so that there is ore above and below the clay. Both must then be mined together. In this case the clay is left in the mine to fill up the vacant chambers and support the roof. Near the outcrop the ore is in loose balls, having separated in this form by the action of the air and water from the solid stratum within. By the same causes the color of the exposed ore changes from the original white, or light gray, to a reddish brown and yellow, mixed in spots with a dirty gray shade.

The composition of the ore is that of some of the class known as clay ironstones. Two analyses are given by Professor Rogers in the State reports, as follows:

1. Iron ore from the bed at Astonville, Frozen Run, Lycoming County.

Light gray mottled consists of minutely crystalline carbonate of iron, of a pinkish yellow color, sometimes velvet-like.

Silica and insoluble matter	28.7
Alumina	0.8
Protoxide of iron	42.2
Carbonate of lime	0.6
Carbonic acid	25.8
Water	1.5
	99.6

This specimen contains 32.8 per cent metallic iron.

2. Iron ore from Ralston, Lycoming County, (upper part of the bed.)

Spathose texture, somewhat laminated, silicios, colour ash gray—composition in 100 parts:

Silica and insoluble matter	28.80
Alumina	1.00
Protoxide of iron	41.22
Lime	0.50
Carbonic acid	24.00
Water	4.28
	99.80

This specimen contains 32.6 per cent. metallic iron.

After heating, 100 parts of the first of these samples will weigh 76.98 parts: 100 parts of such ore contain peroxide iron 60.90, pure iron, 42.63; 100 parts of the second become, after heating, 76.49: 100 parts of such ore contain 59.80 peroxide iron, and will yield, 41.86 per cent. iron.

The following analyses are of samples I selected the present season from the old workings. They are made by A. A. Hayes, M.D., of Boston, assayer to the State of Massachusetts. For purpose of comparison, the iron is reckoned as peroxide, although it occurs in the ore in the protoxide state. The silica, alumina, lime, magnesia, and oxide of manganese, are all enumerated as

foreign matter, none of them, excepting the silica, being in quantity sufficient to affect the working of the ores. If the last named, however, was found in notable quantity, mention is made of it, from the fact of its tendency to improve the quality of the iron produced.

3. Small piece of ore taken from the old workings at the head of the inclined plane, after twelve years' exposure on the surface. This exhibited a surface coating of fine crystals of carb. iron.

100 parts afforded,

Peroxide iron	66.44
Foreign matter	9.40
Carbonate of lime	2.80
Carbonic acid and moisture	21.36
	100.00

100 of natural ore yield 46. of iron.

4. A light gray carbonate, with brown, and brown yellow spots, streak white, from the old workings on the Red Run side.

100 parts of this ore in the natural state yield—

Peroxide iron	47.48
Foreign matter	30.08
Carbonic acid and moisture	22.44
	100.00

100 parts after heating become 77.56.

100 parts of such ore contain 61.21 peroxide iron, and afford, by reduction, 42.84 of iron. Both these samples were found to contain a notable proportion of oxide of manganese.

Calling the average thickness of this ore only three feet, and its weight to the cubic yard only 2½ tons, by which estimates a large allowance is made for waste, each acre contains 12,000 tons. The 1700 acres of summit lands then contain 20,570,000 tons of this ore. There can be no question as to the bed extending under the whole area, as it has been opened and worked on both sides of the mountain, as well as even on the other side of Lycoming Creek, upon the lands of the Ralston Company.

The next bed of ore is in the same red shale formation, about ninety feet below the conglomerate and white ore. A drift has been cut about 150 feet into the bed on the Frozen Run side. At the end it presents a breast, four feet high, of a reddish colored ore. The lower, 2½ feet, is of a heavier quality than the upper portion, of structure slightly oolitic, and of different shades of color after exposure. The following is the result of its chemical examination by Dr. Hayes:

5. Externally brown colored, fresh fracture red, amorphous, streak red, a red clay ironstone. 100 parts of this ore in the natural state afford of—

Red oxide of iron	51.16
Foreign matter	41.60
Carbonate of lime	1.64
Moisture and carbonic acid	5.60
	100.00

100 parts of this ore after being heated become 94.40 parts.

100 parts of such ore contain 54.18 peroxide iron, and afford by reduction, 37.92 of iron.

6. Mottled variety from the same bed as No. 5, color slate gray, dark and brown in spots, streak white.

100 parts of this ore in the natural state afford of—

Peroxide iron	28.04
Foreign matter	56.60
Carbonate of lime	4.76
Moisture and carbonic acid	10.60
	100.00

100 parts of this ore after being heated, become 89.40 parts, and afford 31.76 peroxide of iron, or when reduced 22.23 iron.

No. 5 contained a notable quantity of oxide manganese; No. 6 only a trace of it. The ore from this bed has been found very useful to mix with the white ore, of which it serves to correct the tendency to make red short iron. Being lower down it covers a larger area than the white ore. The number of tons to the acre may safely be rated at 10,000.

A band of red "block ore" is found about ten feet lower down. It measures about 18 inches in thickness at the outcrop. Its analysis does not make it out to be a valuable ore, its yield being only 17 per cent. of iron.

The only other ores are the kidney ores of the coal formation. The quantity of these yet met with in this region is too uncertain to place any dependence upon them. I have seen very good balls worked out of the shale beds on the Ralston property, on Rocky Run, and have noticed similar ore on Red Run. If valuable at either of these places, they may be expected to prove so in the continuation of the same strata through this property. If not sufficient for a dependence, they may be found useful to mix with the other ores.

BITUMINOUS COALS.

The coal formation rests upon the conglomerate, occupying a less area than this rock, and the upper beds of the series less than those near its base. The greatest thickness of this formation has already been stated to be about one hundred and twenty feet. The number of coal beds has not yet been exactly ascertained. I have seen four at one locality on Red Run, and the same beds are found elsewhere on the property of the Company.

One bed, supposed to occupy about the position of the highest in the section, has been opened upon the mountain, about three-fourths of the way across to Red Run. The drift, having caved in, rendered it impossible to examine this bed particularly. It is said to be three and a half feet thick, and to have furnished good coking coal; about 30 tons of iron have been made from it in the blast furnace. The coal of the different beds does not differ very much in external character; portions of the same bed, however, are found of brilliant columnar coal, and other layers of a dull compact structure, of the kind sometimes called "bony coal." The most reliable beds at present known are the two which are separated by four or five feet of shale. Many hundred tons have been mined out of these beds on Red Run, adjoining the tract I am describing, and they have also been opened and worked to some extent upon the Company's lands, about thirty rods north of their openings on the white iron ore bed, on the Red Run side of the mountain. The bed measuring two feet seven inches in thickness, includes a layer of slate two inches thick two-thirds of the way up from the floor. The coal below this slate is the most glossy jet black, columnar, and somewhat friable; the upper third is sounder, but not so brilliant nor free burning. In the Report of Professor Walter R. Johnson on the qualities of American coals, are given the results of his examination of the Ralston coal, which will probably apply to the continuation of the same beds across the creek. The composition was proved by analysis to be much like that he gives of the Blossburg coal. They are as follows:

	Ralston.	Blossburg.
Moisture	0.670	1.339
Sulphur	0.030	0.853
Other volatile matter	13.807	13.927
Earthy matter	13.961	10.773
Fixed carbon	71.532	73.108
	100.000	100.000

Both these coals contain rather a large proportion of earthy matter. The much smaller percentage of sulphur in the Lycoming coal renders this far better adapted for use in the manufacture of iron, where strength is requisite. The weight of the coal, calculated from its specific gravity, was 86.74 lbs. to the cubic foot; that of the broken coal was 55.38 lbs. to the foot; the bulk of a ton of the latter would be 40.45 cubic feet. Notwithstanding the amount of cinders, the coal shows little tendency to form clinkers; the residuum melts with difficulty, and the ashes are shed without clogging the grates.

The color of the ashes is a grayish white, like that of wood ashes. The coke made from the coal is sound and dense, con-

taining nothing injurious to the quality of the iron that may be made by its use. A larger proportion will be required to the ton of iron, than if it belonged to those qualities that contain the least earthy matter. In the blast furnace such coal would aid by its silicious and aluminous ashes the fluxing of highly calcareous ores, but would require a larger proportion of limestone with ores deficient in lime, than would charcoal or pure anthracites. Allowing the weight of the coal in the bed to be eighty pounds to the cubic foot, clear of waste, and the yield two feet in thickness, each acre contains 3484 tons of 2000 lbs. each. There are probably six feet of workable coal in the three lower beds, and others still may yet be found. I think it would be safe to estimate their covering at least one thousand acres.

Besides the use of this coal for manufacturing purposes on the spot, it is important to consider its value for shipment to the seaboard, or to the interior of the State of New-York. By the railroads now in process of construction, the coal may be delivered in New-York Bay at the following cost, allowing the same rate for freight as on the Baltimore and Ohio Railroad.

Mining and handling per ton	$0 78
Freight from Lycoming to Williamsport, thence to Catawissa, thence by continuous lines of railroads in process of construction, 247 miles at 1 cent per ton per mile .	2 47
	3 25
Add 10 per cent. extras	32
	$3 57

The coal from the Cumberland mines in Maryland is estimated to average in New-York Bay as follows:

Mining and handling	$0 68
Freight over Baltimore and Ohio Railroad, at same rate as above, 175 miles	1 75
Freight thence to New-York	1 75
	4 18
Add 10 per cent. extras	42
	$4 60
Difference in favor of Lycoming coal	1 03

Another great market for it is the western and interior portions of New-York State, a region which the Maryland coal cannot reach, but which (by the railroad now making to Elmira, and thence by the various roads already made, and in progress, diverging to all parts of the State) is laid open to most cheap and convenient access from the Lycoming district. And as from its freedom from sulphur, this coal is found to be well adapted for the manufacture of iron, and for blacksmiths' uses, a large demand for it may be confidently expected in this extensive region. The

only bituminous coal now known over the greater part of it is that from Blossburg. But were the supplies of this ever so abundant, it would seem that the greater purity of the Lycoming coal, so far as sulphur is concerned, should give the latter a decided preference.

FIRE-CLAYS.

Beds of fire-clay frequently occur underlying the coal beds. At some points the beds become of a shaly character, and then turn again to good fire-clay. On the Ralston side I have observed the floor of the coal to be sometimes fire-clay of promising appearance, and I have no doubt a similar material will be met with on the west side of the creek, though I have only yet noticed shales under the coal beds. I have already referred to the fire-clay associated with the white ore below the conglomerate. This clay is abundant, and appears to be of very good quality. It will be extracted to large amount in working the ore, and is certainly well worthy of a thorough trial to prove its suitableness for manufacturing fire-brick.

BUILDING STONES.

Building stones of any dimensions can be obtained at the base, and on the sides of the mountain, from the loose blocks of conglomerate which have rolled down, or from the equally durable but less massive sheets of the slaty sandstones, which every where cover the slopes.

Flux.—The limestone formerly used in the charcoal furnace was brought up upon the railroad from Williamsport, where it is found occupying a large portion of the West Branch valley. This limestone is very pure, and well adapted for fluxing the Lycoming ores. A piece I took from the furnace was analyzed by Dr. Hayes, with the following result:

Carbonate of lime	93.20
Carbon and sand	5.20
Moisture	1.60
	100.00

This limestone costs in Williamsport 68 cents per ton, and to transport it to Lycoming about 50 cents more. Half a ton was required to the ton of charcoal iron, and a ton and a quarter to the ton of iron made with bituminous coal. It is supposed, however, as already remarked, that no more limestone will be required in large furnaces built expressly for using stone coal, than in those adapted for charcoal.

In consequence of the distance this limestone is brought, it became an object to seek some other source of supply of this important material in the manufacture of iron. I have therefore examined several beds of limestone, which occur near the base of the red shales and sandstones. They come up to the surface on a

branch of Roaring Branch, about six miles from Lycoming, and also along the Lycoming Creek, seven and a half miles above the site of the new furnace. At the former locality, which is in a deep gorge of a run called Frenchman's Lick Run, heavy layers of a blue shell limestone are seen rising up the side of the hill, on an angle of from 45° to 50°. The quantity is sufficient, but it is desirable to trace the bed to a more accessible point. Analyzed by Dr. Hayes, this limestone was found to have the following composition. The iron estimated as peroxide though occurring as protoxide.

Peroxide of iron	16.08
Carbonate of lime	75.60
Foreign matter	7.12
Moisture	1.20
	100.00

100 parts of this will afford 11.25 of iron by reduction.

With the exception of the iron this limestone contains, it is not very different from the Williamsport limestone, and it is not improbable it may work equally well in the furnaces. If so, it can, no doubt, be obtained at less cost.

Analyses were also made of the calcareous rock from the other locality, where it is found seven feet thick. Though the varieties of this are unsuited for fluxes from the large proportion of foreign matter (alumina and silica), it may be well to preserve for reference the record of their composition.

The first is a brown shell limestone, from lowest part of the seven foot bed at Newell's.

Carbonate of lime	53.20
Peroxide of iron	16.96
Foreign matter	26.80
Moisture	3.04
	100.00

100 of this will afford 11.87 of iron.

The second is from the upper part of the same bed.

Carbonate of lime	56.20
Peroxide of iron	5.76
Foreign matter	35.20
Moisture	2.84
	100.00

The third is from a layer, apparently very ferruginous, out of the upper part of the same bed.

Peroxide of iron	21.12
Foreign matter	26.08
Carbonate of lime	48.40
Moisture	4.40
	100.00

This will afford 14.78 iron by reduction from 100 parts in a natural state.

The last is a grayish colored stone from the same bed.

Peroxide of iron	11.40
Foreign matter	76.20
Carbonate of lime	9.60
Moisture	2.80
	100.00

CHARCOAL FOR THE MANUFACTURE OF COKE IRON.

This is not so important an element for consideration, but as the old furnace will probably continue to be run for the production of the very best qualities of charcoal iron, it must not be neglected. The mountain tops, as before mentioned, are covered with a growth of very large maples, beech and oak. The sides abound more in hemlock. Above Ralston, however, are heavy hard wood forests extending down into the valley. These could have been purchased a few months since for five dollars per acre, or the wood for twelve and a half cents per cord standing.

The railroad north will pass through many miles of such woodland, so that the price of charcoal will long continue very low. It is estimated at four and a quarter cents the bushel delivered at the furnace. Contracts are taken at this price.

There remain now, to consider *the cost of manufacture, the quality of the iron, the market, and the capacity of production of the projected works.*

ESTIMATE OF COST.

The following are the expenses of a ton of charcoal iron when the furnace is in steady running:

Three and a half tons of ore	$2 63
150 bushels charcoal	6 38
Half a ton limestone	75
Labor, $2 50; repairs, $1	3 50
Superintendence and interest	2 00
	$15 26

With coke for fuel, and the use of large furnaces, there will be a very considerable reduction in the cost of the iron. The cost of transportation of the ore to the furnaces will be very much lessened by the railroad descending all the way from the mines. This is now in process of construction, being laid out from the mines on the Red Run side, and winding around the front of the mountain to a convenient site for the furnaces above Lycoming village. By opening the mines on this side, they can be worked with less expense by reason of the greater facilities of drainage, as the strata incline towards Red River. The saving in the three tons of ore will therefore more than make up for any additional

amount, if any, of limestone, that may be required. How much will be saved in the fuel I can make no estimate. The amount must be considerable, from the saving in teams alone; mules will be required only enough to draw back the empty cars, which will run down the track from the mines, carrying all the coal or coke. The general expenses of the smelting will also be greatly reduced by the increased extent of the business, so that I should have no hesitation in reckoning the saving in this and in fuel at three dollars per ton in the cost of charcoal iron.

Since writing the above, I have received the following letter from Mr. Trego, which gives his views upon the quality and cost of the iron:

"J. T. Hodge, Esq.—

"*Dear Sir*,—You wish me to state to you my opinion of the iron made from the white ores found on the property of the Lycoming Valley Iron Company. I will do so with pleasure, and I think I am as well prepared to speak advisedly on the subject as any person possibly could be, as I have for eight years past been engaged in the manufacture of pig iron from said ore, and can unhesitatingly state that the iron I have made has been uniformly of the very best quality; and that for all kinds of castings, particularly for car wheels, I do not think it has its equal in any other iron in this country. The wrought iron made from the pigs has always proved to be of the very best quality.

"I have found from experiment that it requires from three to three and a half tons of ore to make the ton of iron; and I believe that under proper management iron can be made with mineral coal as cheap as at any other point in Pennsylvania. My estimate for the cost of making iron at Lycoming with mineral coal is as follows:

Three and a half tons of ore at 70 cents	$2 45
Three and a half tons of coal at 60 cents	2 10
Limestone	1 25
Labor and incidentals	4 25
	$10 05

"This estimate is based on actual working of the mines, and with the expectation that the present Company make a railroad to carry the coal and ore to the furnace.

"I will add, that in making this statement, I can do so with unbiassed feelings, as I have not at this time any interest in the coal and iron property of this village.

(Signed) "W. C. Trego."

Mr. Trego is familiar with the expenses of the manufacture of iron at Danville, where he has himself been engaged in the bu-

siness, and where it is made as cheaply perhaps as at any other place in the United States. I am authorized to say, that the actual cost per ton is less than ten dollars.

QUALITY OF THE IRON.

The opinion of Mr. Trego has already been given on this point in his letters. My own knowledge of its quality is from my observations in the year 1839. The following remarks are from my notes taken when on the geological survey of the State:—"The iron made of this white ore is said to bring ten dollars on the ton more than that from any Centre County ore. I saw some of it at Williamsport, where it is cast into stoves, &c. It appears to be No. 1 foundry iron, soft, no ring when struck, but falls like lead, very hard to break, and of a dark gray open grain. It takes the form of the mould in its minutest parts, and makes strong castings. I also saw a little piece which had been refined in a blacksmith's forge, which bore repeated bending back and forth, hot and cold, without fracture."

During my employment upon this survey, of three seasons, I saw no other iron possessing the toughness of this. And now, when its manufacture has for many years been uninterrupted, I find among the iron men of the region the very highest opinions entertained of its wonderful strength either in the pig or bar.

CAPACITY OF PRODUCTION OF THE PROJECTED WORKS.

Since my examination of the property the last spring, a railroad has been laid out, and is now building around the edge of the mountain, from the mines on the Red Run side to a convenient point within a few rods of the rail-road, half a mile above Lycoming village. The length of this road is about two miles. It terminates at the lower end a little over the tops of the two furnaces, now also commenced. By this arrangement, with a descending grade all the way, large quantities of ore and coal can be very cheaply run down to the furnaces.

These two furnaces are planned with all the late improvements; they will be run by a steam engine of —— horse power, already purchased, and the blowing apparatus is of the most complete construction for furnishing abundant blast with even pressure and with hot-blast pipes.

The height of the stacks is to be 50 feet, their diameter across the boshes, fifteen feet. Such furnaces are capable of making, with proper management, over one hundred tons per week each.—It would be within limits to estimate their annual capacity at about 10,000 tons of pig iron.

The charcoal furnace, now reduced to eight feet across the bosh, ought to make at least thirty tons per week, or say 1,500 tons per annum.

Mr. Trego estimates the cost of the coke iron at $10 05 per ton. At Danville anthracite iron costs less than this. But supposing it to cost $12 50, and only 11,000 tons to be made, the whole amount would then be $137,500.

It would be by no means an extravagant estimate to count upon this iron selling at $25 per ton, at the lowest state of the iron market	$275,000
Leaving a difference of	$137,500

Though an estimate like this may appear extravagant, it is not altogether without precedent at other large establishments in this country, fortunately located, and provided with such means as you will have at command, and conducted with the same energy and skill which it will not be unreasonable to expect you will also secure.

Hoping that in your case these anticipations may be fully realized,

I subscribe myself, gentlemen,

Very respectfully, yours, &c.,

James T. Hodge.

New-York, July 6, 1853.

Art. III. THE PROPERTY OF THE SHORT MOUNTAIN COAL COMPANY, SITUATED IN LYKENS VALLEY, PENNSYLVANIA.

This company was incorporated by the Legislature of Pennsylvania, in the year 1851, with a capital of $500,000. Their mineral estate consists of about 2000 acres of land. It embraces seven different tracts, all of which lie in contiguity, except a plat of a few acres, which is occupied by one of the railroads of the company, and a wharf and a basin. This railroad extends from the western terminus of the Lykens Valley railroad to the Wiconisco canal, on which their basin and wharf are placed for the shipment of coal. The Wiconisco canal commences at Millersburg, on the Susquehanna river.

The coal land of the company lies on what is strictly called *The Short Mountain*, in Dauphin county, being that portion of the Broad or Bear Mountain which extends from Bear Gap, at the town of Wiconisco, to its western extremity,—about four miles distant. The whole of the Short Mountain, thus distinguished, is owned, from one end to the other, by the Short Mountain Coal Company. This mountain, as we have said, is four miles in length, and stretches from the ravine, called Bear Gap, at Wiconisco, to

within nine miles in a direct line of the borough of Millersburg, on the Susquehanna river.

The Lykens Valley railroad, which is a highway, runs along side of the Short Mountain through its whole extent, and connects Bear Gap with the Wiconisco canal near Millersburg. It is fifteen and a half miles in length. A lateral railroad of the Short Mountain Coal Company connects their mines at Bear Gap with the Lykens Valley railroad. The coal is carried on this road from Bear Gap to the Wiconisco canal, where it is shipped in boats for distant markets. The Wiconisco canal is twelve miles in extent, and extends from Millersburg to Clark's Ferry, where the Pennslyvania canal crosses the Susquehanna. This canal was constructed for the purpose of giving an outlet to the minerals of Lykens Valley. From Clark's Ferry, the Pennsylvania canal furnishes a communication with Harrisburg, the capital of Pennsylvania, thence with Columbia, and finally with the Tide Water canal, which loses itself in the Chesapeake. The distance from Millersburg to Harrisburg is twenty-six miles by canal, from Harrisburg to Columbia, it is twenty-eight miles. A railroad, now in progress, and which is expected to be completed in the course of next summer, is intended to unite Sunbury, through Millersburg, with Harrisburg. On the completion of this road, Lykens Valley will be in communication both by railway and canal with all the Atlantic cities.

The distance to Baltimore is as follows, to wit: Millersburg to Harrisburg, say 26 miles; Harrisburg to Baltimore, 84 miles, making the distance 110 miles.

The first printed account which we have seen of the coal-field of the Short Mountain and Bear Valley (which latter designation is now applied exclusively to the extension from Bear Gap eastward), was made in 1839. In that year a convention was held at Philadelphia from different parts of Pennsylvania, to report to its Legislature upon "*the coal fields, deposits of iron, and other mineral products of the State.*" The committee appointed for the Bear Valley coal basin, comprehending what is now known as the Short Mountain of Lykens Valley, made a report accompanied by maps, showing the position of the lands for convenience of outlet, and the thickness and extent of the coal seams. In their report they describe the position of the Short Mountain first rising into view in the middle of the beautiful and luxuriant plain which is known as Lykens Valley. In order to give some idea of the region we will quote from the report of the committee, premising that the celebrity of "the favorite fuel known in Harrisburg as "*Lykens Valley Coal,*" was given to it by the coal mined from the Short Mountain. The committee thus describe this important coal-field:

"Lykens Valley, situated in the upper end of Dauphin county, is bounded on the west by the Susquehanna, on the north by the Mahantongo Mountain, and on the south by Berry's Mountain. Its breadth increases from the Susquehanna, where it is about four miles, as it extends eastwardly a distance of near nine miles, where is is about six miles in breadth. At this point the coal mountains rise, dividing it into two parts; the northern still retaining the name of Lykens Valley, extends about twenty miles further east, varying in breadth from two to four miles. The southern portion takes the name of William's Valley, runs to the east eighteen miles, where it is terminated by the junction of the Big Lick and Red Mountain. Its width is less than Lykens Valley, from the point of separation eastward. The Wiconisco creek partly rises in Williams' Valley, and after passing through that and the western portion of Lykens Valley, falls into the Susquehanna, at Millersburg. The eastern part of Lykens Valley is watered by branches of the Mahantongo, as will be seen by reference to the accompanying map. The *Short* or *Thick Mountain, rises abruptly in Lake Valley, as above described, near nine miles east of the Susquehanna.* It runs an unbroken ridge towards the east, three miles, where it divides into two distinct mountains, called the North or Thick Mountain, and the South or Big Lick Mountain. These mountains rise about 1000 feet above the outer valleys; are regular in their height and parallel direction. The deep narrow space between them is called Bear Valley, which sinks about 800 feet below their summits, and is near fifteen miles in length. The outlets from this valley are at *Bear Gap*, where Bear creek breaks through the Big Lick Mountain, and passes into the Wiconisco in Williams' Valley. * *

"*The coal of this basin is the nearest of any other anthracite to the Chesapeake Bay.* The formation is regular, and without fault from end to end of the basin in both mountains, the dip of the strata being inward, and forming an angle of about forty-five degrees with the horizon. It is all red ash coal, except a few grey ash veins in the *Thick Mountain;* it kindles very easily and burns freely; *it is a favorite fuel, known in Harrisburg as the 'Lykens Valley Coal.'*"

In a subsequent part of their report, the committee inform us that the aggregate thickness of the seams or veins of coal, discovered in the two mountains, is 87 feet; that much of this vast body of mineral lies above the water level; that the average breast is "over 600 feet," that the breadth of the basin from the top of the red shale on one of the two parallel mountains to the top of the red shale on the other, is about two miles. They also speak of rich iron ore as being abundant throughout the region, of fire-brick clay, of the fertility of the farming land, and the con-

sequent capacity of the valley to sustain a great population cheaply. The committee venture to say, from the facility and cheapness of mining, that within five years from the commencement of regular operations, by shipments of coal, the quantity annually sent to market will exceed 500,000 tons.

How much may be mined and sent to market, it is impossible to predict, but it may be truly said that the capabilities of the region for mining and sending large quantities, are great. Baltimore, Washington, and the thriving towns and active shores of the Susquehanna, and the populous manufacturing district extending far and wide around, are the natural geographical marts for the Short Mountain coal. As an anthracite, it seems geographically to command the southern market without a competitor.

The distinctive character of the Short Mountain coal of Lykens Valley, is fully described by Professor Walter R. Johnson, in his report of 1843, to the Secretary of the Navy of the United States, communicating a series of experiments made by him on American coals. His subjects are divided and classified under appropriate heads. The professor thus speaks in his elaborate report under the head, "*Character of Lykens Valley Coal*:"

"This coal is of the variety generally known in commerce as free burning red ash coal. It enjoys already a high reputation for giving, when used for domestic purposes, a steady but lively heat, and yielding little earthy residuum. It is also highly esteemed by smiths and founders; and not less by those who have applied it to the production of steam, the burning of lime, and the smelting of iron.

"The exterior characters of the coal of different beds are somewhat various; and it is not a little remarkable that the kind most sought after by blacksmiths, is that which at first sight might seem the most unpromising, being often covered almost entirely with a coat of yellowish or red oxide of iron, from which it has received the name of the 'rusty vein.' In other beds the coal is of the clearest jet black, and presents the varieties of tint, dull and bright, due to a greater or less intermixture of mineral charcoal with the pure anthracite.

"The following analysis of this coal, with the subsequent comparison between it and the celebrated Welsh anthracite, used by Mr. Crane, may be interesting in view of its applicability to iron manufactures:—

Tabular view of the Analyses of nine samples of Anthracite from the mines of the Lykens Valley Coal Company.

No. of the sample.	Specific gravity.	Water expelled at 300°	Volatile matter lost at redness.	Fixed carbon.	Earthy residue.	Exterior and other characters of coal.	Characters of ashes.
1	1.391	1.450	5.140	87.950	4.450	Deep black—fracture irregular, shining—or dull from intermixture of charcoal—of which the structure is distinctly seen—and which is soft—sectile and easily combustible—gives out gas, but does not change form on being ignited.	Color deep brown—inclining to reddish brown—light—little coherent, moderately gritty.
2	1.404	1.380	4.56	89.300	4.750	Brownish black—iridescent or steel blue—surface shining and striated—woody structure of the mineral charcoal seen as above—gas burns brightly.	Light fawn color, moderately gritty—light—lightly coherent.
3	1.416	0.70	9.30	85.700	4.300	Lustre silky on a carbonaceous ground—mixture of mineral charcoal in certain parts, with a coke-like mass.	Brownish buff—slightly coherent.
4	1.374	1.10	5.50	86.700	6.700	Very similar to the preceding.	Brownish—dirty red, with slight tinge of purple—very slightly coherent—incineration probably not quite complete.
5	1.374	0.88	7.47	87.750	3.900	Color deep black—fracture uneven, with appearance of coke or charcoal.	Yellowish red—inclining to brown—dense—coherent.
6	1.385	0.90	7.40	88.650	3.050	This sample is less marked with carbonaceous deposits than the preceding—a purplish red tint marks some of the partings, or cross cleats.	Color deep fawn, gritty—heavy, coherent.
7	1.383	0.690	7.75	87.900	4.150	Color deep black—surface shining, striated, silky, and occasionally of a dull charcoal lustre—fracture uneven, original grain apparently obliterated by pressure.	Bright fawn—with slight tinge of rose color, gritty, coherent.
8	1.398	1.314	10.54	83.996	4.150	Appears to resemble certain varieties of bituminous coal in structure, fracture, and lustre, with slight specks of pyrites.	Bright buff color, tolerably coherent—slightly gritty.
9	1.378	1.380	5.94	87.000	5.700	Dull black—surface shining at the fractures which cross the grain of the coal—horizontal seams conspicuous, fine carbonaceous dust seen in the interstices.	Incineration not quite perfect, minute particles of coal perceptible—color deep fawn.
mean	1.390	1.111	6.985	87.360	4.572		

"The anthracite of Bear or Lykens Valley is marked with numerous impressions of the vegetable substance from which the coal has been derived. These are not confined to the slates, but penetrate the body of the anthracite itself. The fossils are pre-

-cisely similar in kind to those found in this and other countries, among the beds of bituminous coal, and correspond perfectly with descriptions already extant; and the minutest characteristic line traced on a bituminous coal slate in Great Britain, France, Germany, or South America, has its exact counterpart in the anthracite fields of Pennsylvania. Indeed, there can no longer exist a question about the fossils of anthracite and bituminous coals belonging to the same geological period, since we know that in one and the same coal trough we have perfect anthracite at one end, and perfect bituminous coal at the other, with a regular gradation of qualities between them.

"Among the many varieties of anthracite found in Pennsylvania, none, according to my observation, has a stronger analogy to that of Yniscedwyn in Wales, used at Crane's iron works, than the coal of Lykens Valley. * * * * * *

"The average quantity," the professor continues, "of earthy matter in the Welsh coal, is 4.329. In the Lykens Valley anthracite, the table shows a mean of 4.572.

"The quantity of carbon in the coal of Yniscedwyn, as deduced from the preceding data, is 87.500, while the table shows 87.300 in that of Lykens Valley.

"Bringing the preceding statement into a single view, the analogy will be perceived at a glance:

	Sp. Gr.	Vol. Mat.	Carbon.	Ashes.
Yniscedwyn coal	1.354	8.072	87.599	4.329
Lykens Valley, do.	1.390	8.066	87.360	4.572

"If any thing more were wanting to make out the absolute identity of character in these coals, so remote from each other in locality, it would be supplied by the perfect similarity of effects observed to result from their distillation, yielding at first a gas burning with a pale blue flame, and afterwards, as the temperature rises, one of strong illuminating power, accompanied by a minute portion of bituminous, condensible matter. The illuminating gas seems to commence suddenly its development from the Welsh coal, and perhaps also from that of Lykens Valley, but in the latter this circumstance was not particularly noted."

The same scientific gentleman had made an exploration of the Bear Valley district in 1841, and in the report which he prepared, giving the results of his examination, he describes the peculiarity and extent of the coal formation at Bear Gap. We again quote Professor Johnson's language:—

"The coal formation proper is included in an elongated basin or trough, called Bear Valley, situated between two elevated ridges, viz.: Thick Ridge, on the north, dividing it from Lykens Valley, and Big Lick Ridge on the south, which separates it from Williams' Valley.

"The approach to this valley is through a deep cut or gap in the Big Lick Ridge, called Bear Gap, formed by a creek which comes out of the valley and joins the Wiconisco, by which its waters are conveyed to the Susquehanna river at Millersburg.

"This gap, extending quite through the southern brim of the trough, and dividing the various beds of which the coal measures are composed, has left the edges, or rather *ends* of the coal seams so exposed, as to be entered by horizontal drifrs or gangways, involving no necessity for artificial draining. The coal seams both east and west of the gap, dip northwardly in an angle of about forty-five degrees, and hence, when the gangways have been driven to the proper extent, the workings commence in an ascending direction, and the coal is delivered to cars in the gangways over shutes formed on the floors of the beds themselves. On some of the beds the breadth of working or breast of coal will not be less than 600 or 800 feet. In others it will probably exceed 1,000 feet. This facility of delivering the coal obviates the necessity of handling it after being detached from the solid bed. The mines which I examined were perfectly dry, and more comfortable, therefore, than almost any others which I have visited in the anthracite coal fields. * * * * * * *

"If all the beds of the formation, known to be 80 feet in aggregate thickness, lay in a horizontal position, a single acre of land in which they were so situated would contain 129,067 cubic yards, or the same number of tons of coal; and if the same thickness of coal in a single bed or succession of beds were inclined at an angle of 45 degrees, the quantity of coal in an acre would be increased in the proportion of 142 to 100, or it would then be 183,273 tons. All the beds of an inclined formation may be worked on a single acre of land, supposed to extend in a very narrow strip quite across the breadth of the trough, and the whole number of acres may therefore be considered as possessing like advantages over the same number of acres, of which the strata should be supposed horizontal. In 370 acres there would be found by the preceding computation 183,273 37 × 0 = 56,268,010 tons of coal."

Assuming that the learned writer has accurately calculated the contents of 370 acres, the land of the Short Mountain Coal Company must contain above 280,000,000 of tons of coal.

The real character of a coal in the absence of experience, is determined by the analysis. Professor Johnson has shows what various analyses of this coal prove. But in the year 1845, an examination of the Bear Valley Coal Basin, as it was then denominated, was made by James Hall, State Geological Engineer of New-York. Mr. Hall thus records the result of his experiments and information: "The quality," says he, "of the

coal has been determined by experience, and is in the highest degree satisfactory. It is a free burning anthracite of the best quality. The coal from the veins on the north side affords a grey ash, while those on the south side yield a reddish or fawn-colored ash. Its qualities as a fuel for domestic purposes are of the highest order, and in Harrisburg, where it is much used, it sells for one dollar per ton more than the other coals brought to that place. It is peculiarly adapted for use in open grates, and from its free burning qualities, a small quantity can be ignited, while in the harder white ash coals larger quantities are required. A less portion of draught is sufficient to produce free ignition than in most of the other anthracites, and consequently it is well adapted to purposes where a constant heat, with moderate draught, is required."

Mr. Taylor, in his large work on coals, speaks in the same way; and Samuel R. Kneass, late principal city surveyor of Philadelphia, in a report made in the year 1845, adopts all the statements of antecedent explorers. These several writers refer also to the existence of other minerals besides coal in this basin, particularly the *black band iron stone,* so favorably known in Scotland and Wales, as being abundant. In the list of witnesses to the character of this coal, we ought not to omit the name of General Packer, late Speaker of the Senate of Pennsylvania, and now President of the Harrisburg and Sunbury Railroad Company. In a speech which he delivered in Baltimore, about a year ago, he dwelt upon the high reputation of the Lykens Valley coal, and pronounced it the very best anthracite in Pennsylvania for domestic uses. As an anthracite, it has one peculiarity for which it is marked. A double-handful of the mineral is said to ignite easily, and burn freely till it is entirely consumed to ashes. Other anthracites go out unless a considerable quantity is brought together. This is a recommendation, in mild weather, as well on the score of comfort as economy.

The works of the company are carried on at *Bear Gap,* which is at the eastern end of what is called Short Mountain, and at *Big Run Gap,* where there are several mines near to the line of the Lykens Valley railroad, about two miles from Bear Gap, and also on the *north side of the mountain,* where there is a mine for the supply of coal to the neighborhood. The adits or openings of the coal are seven in number at these different points. The company own two railroads about a mile in length, and a large basin and wharves on the canal at Millersburg; a coal breaker, a steam engine and screen of the largest size, a steam saw-mill, smith shops, carpenter shops, cars, and tenants' houses. Besides these, they have laid out a plat of 150 acres, between their mines at Bear Gap and Big Run Gap, for a town to be called *Coaldale.*

It is well situated for the health as well as the convenience of miners. The operations of the Company in the shipment of coal, we learn, have just been commenced.

Art. IV.—REPORT ON THE DOLLY HIDE COPPER MINE.—By Dr. Chas. T. Jackson.

Dear Sir:—During the autumn of 1846 I examined the Dolly Hide Copper Mine, in the town of Liberty, in Maryland, and made a report of my observations and researches at that time.

The mine had not then been opened to any considerable extent, but only exploration shafts had been sunk through the soil and for a short distance into the vein. The result of my explorations proved that this mine was one of great promise, and since then your continued researches have proved the mine to a still greater extent.

I was therefore called upon to re-examine it, in order to give an opinion of its present condition and probable value as a working mine.

In accordance with your request, I have just re-visited and examined this mine, and have been most favorably impressed with its present state and future promise. The original opinion which I had formed in 1846 I find confirmed by the developments since made of the vein, and in some particulars I obtained additional information of importance.

The result of mining operations and of sales of the copper ores have proved the value of the mine, so far as the work has extended, to be very great; but this must be regarded as a mere beginning of operations, for when your steam-engine is placed upon the property, and extensive works are opened, the yield of the mine must be immensely increased: and when your machinery is put up for preparing the ore for market, the ores will be much improved in richness, and a larger quantity will be dressed for the furnace each year.

Owing to the want of adequate mining machinery, you have been able thus far to work only the out crop of the vein; but when your steam-engine is erected you will be able to open the mine in a proper manner, by making a deep shaft and driving levels, preparatory to stopping the lode of copper ore by inverted grades, which is the proper method of working the mine.

This new work your present company is about to undertake, and I doubt not they will be richly rewarded.

The present openings of the Dolly Hide Mine show that the copper ore is contained in a large vein of white, fine-grained do-

lomite, or magnesian limestone, which bears evident proofs of having been once in a fused condition. This limestone is filled with segregated masses and string veins of rich copper and silver lead ores.

The limestone vein is about 110 feet wide, and is included between strata of blue, green and violet colored clay slate rocks.

The main vein runs north 75 degrees east, and south 75 degrees west, and its dip is 45 degrees to the south, eastward. There seems also to be a branch vein of this limestone extending to the northwestward, while the main vein takes a southwesterly course at its western extremity, this branching forming a Y, opening to the westward, and includes a portion of the slate strata between.

From this circumstance we have a right to regard the limestone as a true vein, and an intruded mass of originally molten dolomite. This being the case, we can readily understand why it should be so richly charged with copper pyrites, and why there should be a segregation of this ore near the junction of the dolomite with the slate rocks, such segregations being well known to result, where a molten metalliferous rock is formed into contact with another kind of rock.

The richest portion of this vein will undoubtedly be found at the angle of the Y, where it branches. This fact has been observed by your miner, Mr. Stephens, who says: "The copper comes in most to the westward of the stope now working." I saw in the level which he has cut that this was certainly the case.

At the easterly extremity of this level, granula argentiferous galena is found mixed with copper pyrites, but the copper ore is nearly free from lead ore, at the westward of the level.

This level is only about twenty feet below the surface, and is fifty-five and a half feet in length and five and a half feet wide. It is estimated that about three feet in thickness of the lode is sufficiently rich in copper ore to be worked, and that two feet of it in thickness may be regarded as good ore. It is mixed more or less with limestone rock, and requires dressing in the usual way for market.

It closely resembles the purple copper ore brought from Valparaiso, (S. A.) in its appearance, and in its association with a limestone gangue. Your mining captain estimates the present produce of the lode at three tons of 18 a 20 per cent copper ore per fathom on this level, and I am of opinion that he is correct in his estimate.

The pure purple copper ore which I obtained from this mine in 1846 yielded,—

Copper	59.382
Iron	13.302
Sulphur	25.720
	99.620

The ore, dressed coarsely for the furnace, has yielded about twenty-five per cent. of copper. It may be raised by the use of proper machinery to a forty per cent. copper ore, without much trouble. On visiting the Baltimore copper furnaces, I was shown the books containing the assays of the ores received there from the Dolly Hide Copper Mine, the assays having been made by Dr. Keener and reported to Mr. Tyson.

These assays, made on working lots of the ore, show its quality as it is sent to the furnaces; and it must be kept in view, that this ore was merely "bucked up" by hand, and hence was not dressed to its highest capability. When the crushing, or stamping mills are set up, and the washing apparatus is ready, you will send to market ore of a much richer quality.

I here copy the report of the assays of the cargoes of Dolly Hide copper ores, received at the Baltimore works, to show what has been already done:

Results of assays of copper ore from the Dolly Hide Copper Mine, assayed at the Baltimore copper furnaces by Dr. Keener, and reported to Isaac Tyson, Jun.:

101,098 lbs.,	bought of R. Coale,		....	1842	20	per cent	copper.
3,916 lbs.,	do.	Dolly Hide Co.,	July	1847	32	do.	do.
14,254 lbs.,	do.	do.	do........		26¼	do.	do.
6,965 lbs.,	do.	do.	Sept.	1847	24⅝	do.	do.
4,825 lbs.,	do.	do.	April	1848	23⅝	do.	do.
6,360 lbs.,	do.	do.	do.......		19	do.	do.
14,051 lbs.,	do.	do.	Dec.	1849	32·7	do.	do.
1,320 lbs.,	do.	do.	May	1850	25	do.	do.
39,144 lbs.,	do.	do.	May	1853	25	do.	do.

191,933 lbs. average yield ....22 13-32 per cent.

BLACK DIRT.

4,244 lbs.,	July, 1847........................	7	per cent.
3,294 lbs.,	do.	7½	do.
23,878 lbs.,	do.	13-16	do.
6,082 lbs.,	do.	16⅛	do.
11,316 lbs.,	do.	14·3	do.
19,563 lbs.,	Sept. 1847	8¼	do.
27,489 lbs.,	April 1848	7¾	do.
29,864 lbs.,	do.	7⅞	do.
3,319 lbs.,	Nov. 1849.	8·2	do.
17,088 lbs.,	Dec. 1849	12·1	do.
11,387 lbs.,	Jan. 1850	15·9	do.
1,935 lbs.,	do.	13·3	do.
4,945 lbs.,	do.	10·8	do.
24,851 lbs.,	April 1850	11⅛	do.
22,720 lbs.,	May 1850	11⅛	do.
1,014 lbs.,	do.	10·45	do.
12,320 lbs.,	May 1853	10·45	do.
49,157 lbs.,	do.	13·30	do.

284,481 lbs. or 127 tons average yield...........10⅝ per cent.

It should be remarked that the black dirt sent to the Baltimore Copper Works had been mostly sifted, so as to remove the fragments of rich copper ore which were originally mixed with it; and therefore its yield is here reported to be less than that of the average samples assayed by me in 1846, my results giving 17 8-10ths per cent. of copper as the yield of that ore.

It seems wholly unnecessary to separate the coarse ore from it, for the yield of the black earth just as it is dug out of the meadow, is high enough for profitable smelting, and this earth may at once be sent to market in stout canvas bags, which can be returned to the mines to be re-filled, after they have been discharged at the furnace. The black earth consists of a mixture of oxides of manganese and of iron, with black oxide of carbonate, and the sulphuret of copper, the two last consisting of small fragments. The oxide of manganese, by furnishing oxygen, will aid in the process of calcination, and of roasting the sulphurets of copper and iron, and is therefore quite useful.

I would observe also, that the admixture of a certain proportion of limestone with your copper ore, is advantageous to the smelters, who are generally supplied with ores mixed with quartz; for the lime serves for a flux to the silicious ores, thus saving the cost of adding limestone to the charge of the furnaces.

The Dolly Hide copper ore, on account of its admixture with limestone, is really more valuable to the smelter on that account.

From the observations I have been able to make, in conjunction with your miners, I am of opinion that your vein can be depended upon for at least 800 feet in length, and two feet in width, as a rich working mine; its depth no one can know before sinking into the vein, but there is every probability that this vein, like others of the kind, extends to a great depth in the earth, and, perhaps, far below the reach of any mining operations.

The most important question of a practical kind now before your company is the erection of suitable mining machinery; and it has been thought best to direct the erection of a seventy-five horse power steam-engine on the location, near the old limestone shaft, which will afford a solid foundation. It is proposed to deepen the limestone shaft, and to make it the engine shaft of the mine.

When your mines have reached a depth of about 120 feet, it is proposed to drive a level upon the lode, at the point where the vein forks, which proves to be the richest part of the lode.

It is evident that since the copper ore occurs most abundantly near the junction of the limestone with the slate rock, your miners will follow this line of junction in their working of the vein. The copper ore taking to the western extremity of the lode, it is proposed to follow that part of it so soon as the shaft

is prepared, and the level ready to be driven. I have no doubt that, when your stopeing ground is fairly opened, you will be able to raise an enormous amount of rich copper ore, equal to the best imported from Valparaiso. The occurrence of this mine, only a few miles from a railroad extending to Baltimore, and at a distance, by rails, of not more than forty-seven miles from that city, is an important consideration in estimating the value of this property, and I congratulate your company on your great advantages in working a mine so near to market, and in possessing a vein of the richest kind of copper ore.

With great respect, I am your obedient servant,

CHARLES T. JACKSON, M. D.,

Assayer to the State of Massachusetts and to the City of Boston;

Geologist and Chemist to several of the States.

Art. V.—MODERN GEOLOGY.*

The attention which the science of Geology is now attracting from that portion of the public which possesses claims to more than ordinary intelligence, is a very gratifying indication. The dissemination of its principles among a greater multitude of observers, will cause a sharper scrutiny for facts, a severer discrimination of their importance, and a bolder exposition of some of the illogical positions now clung to as fundamental truths by writers generally upon this subject.

Nevertheless, it is a brilliant theme, if the application of such a term to this science will be forgiven by its more fastidious devotees. It is more truly the child of professors and learned teachers, than almost any other of the modern sciences. And it will not be regarded as a severe remark to say, that many of the fathers have blindly made a pet of their offspring. In some instances this has, for a time, sadly interfered with its future development. It would have found a much more hardy growth, if, from necessity, it had nestled in the brawny arms of hard industry, and been thrown upon the world, at an early stage, to be worked and wrought out in the service it could render to mankind. But it has fared far more tenderly than all this. It has

* Principles of Geology, or the Modern Changes of the Earth and its Inhabitants, considered as Illustrative of Geology. By Sir Chas. Lyell, M.A. F.R.S. New and entirely revised edition, illustrated with maps, plates, and woodcuts; 8vo. pp. 834. New-York: D. Appleton & Co.

The Elements of Geology, adapted to the Use of Schools and Colleges. By Justin R. Loomis, with numerous illustrations; 12mo. pp. 189. Boston: Gould & Lincoln.

always been among friends, except when it set the clergy at loggerheads with its professors, respecting the age of Mother Earth; the former of which insisted that she was still a youthful virgin, while the latter avowed, by their principles, that it was beyond the compass of numbers to express her years; thus throwing overboard Moses, the flood, and all the early and sacred muniments of the faith of mankind. This was a sad mistake. At least it was impolitic to make such a desperate and sweeping onslaught. It has roused a multitude of antagonists, who have been waging a severe contest, which is still somewhat kept up, and it will go hard if geology does not get some severe pushes to the wall, and finally come off with her skirts shorter by a flounce or so.

We have said above that this science has always been among friends. Perhaps the general nature of this remark should be somewhat limited. There was a time when these friends waged a severe contest together, somewhat like those strifes on "high Olympus," before "the stars sang together." One party fought under Pluto,* the Grecian god of the infernal regions, and the other under Neptune, who, with his trident, lashed the seas and oceans into obedience. Why these modern geologists should contend under the banners of such fabulous heathen gods, thus scorning the realities of the present time, and outraging the religious sense of sober people, is not so easily explained; but if we may be permitted to make a suggestion to the reader alone respecting them, it would be that they were "heathen fellows."

That this science is attracting more attention at the present time with the public, we infer from many indications, not the least important of which is the appearance of the two volumes before us. One, as its title states, is designed as a text-book for schools and colleges, and the other is no less than a new edition of the most valuable work upon the principles of geology yet published. The style in which they are issued from the press, the variety and beauty of the illustrations, and the general manual execution, are of a high order. They are admirably suited to instruct the uninformed in the wonderful facts and still more wonderful representations of geology.

We shall proceed to notice such points in these volumes as occur to us as worthy of the attention of the reader. In the smaller work we read, under the title of—"Of the Temperature of the Mass of the Earth," the following:—

"Heat has been the most efficient agent in determining and

* Sir Chas. Lyell, we notice, softens this reproach somewhat, by designating this party as "Vulcanists." But this hardly helps the matter. Vulcan was an old blacksmith, an associate of the others, and of no better morals. Besides, the very subject in dispute is known even to this day under the cognomen of "Plutonic." Ah, Sir Charles! this won't do.

modifying the structure of the earth; and, in order that the explanations of the phenomena referable to this cause may be intelligible, some idea must be formed of the actual present condition of the mass of the earth with respect to heat.

"At any point of the surface there are variations of temperature, depending on external causes. But these variations are found to extend only a little way below the surface,—never more than a hundred feet. At greater depths, it is found that the temperature invariably increases with the depth. Deep mines have always a temperature above the mean annual temperature at the surface. The water obtained by deep boring is always tepid when it comes to the surface. The thermal springs, so abundant in this country and in Europe, are so situated as to justify the impression that their waters come from great depths. To make these general observations of any value, we must determine the law by which the temperature increases. The result of all the observations yet made, in mines and upon wells and springs, is that, below the first hundred feet, the temperature increases by one degree of Fahrenheit's scale for every forty-five feet.

"Regarding this law of increment as applicable to all depths, at ten miles below the surface we should have a temperature above that produced by the combustion of wood; and at twenty-five miles, a temperature of three thousand degrees, by which nearly all mineral substances would be reduced to a state of fusion.

"The general conclusion of a temperature sufficient to melt the mineral substances of which rocks are composed, at no considerable distance below the surface, is confirmed by the fact that portions of the interior of the earth—at least, at the volcanic centres—are in a melted state. The intimate connection between some volcanoes situated a hundred miles or more apart, so that they are alternately in a state of activity and rest, indicates that these centres are connected—that subterranean melted lava extends from one to the other, so that when one is active, the elastic force is relieved at the other. These deep-seated lakes of lava must therefore underlie large areas.

"We are justified, then, in concluding that the mass of the earth, with the exception of a comparatively thin superficial layer, has a very high temperature."

It is worth while to distinguish in these remarks what things are stated to be facts, and what are inferences merely. Below 100 feet, the temperature invariably increases with the depth, for the degree of depth examined at the rate of 1 deg. in 45 feet. Portions of the interior of the earth—at least at the volcanic centres, are in a melted state. Such are the facts. Let us turn to the inferences. Regarding this law of increment as applicable

to all depths, at ten miles below the surface we should have a temperature above that produced by the combustion of wood. And what, Mr. Geologist, would be the temperature at the depth of 5000 miles? Human faculties are incapable of conceiving any such temperature as the statements here made require. In a word it is beyond the experience of humanity. To human reason, therefore, it is nonsense. It is not necessary to go beyond the province of reason. Every work upon geology assumes the crust of the earth to be about ten miles in thickness, and caused by the cooling of the surface of the mass originally in a liquid or fusible state. If this supposition were true, the pressure of the atmosphere is such as to cause lava to spout out at every pore. But the ocean has been sounded to the depth of five miles, and there is no evidence that this is its greatest depth. Geologists, when they speak of the depth of oceans and height of mountains, regard it as much deeper. What then becomes of the ten mile crust? Is the earthy substance equally thick under the depths of the ocean, as where it is exposed to the atmosphere? If so, what is the proof? If not, then why is not the ocean made to boil by the near contiguity of this internal heat? Or, why do not those indefinite, indescribable, inconceivable subterranean forces, with which you keep the bowels of Mother Earth in constant pain burst through this thin portion of the crust? In presuming a crust of the earth of ten miles in thickness, we have never yet seen the inequalities produced by the depth of the ocean taken into consideration. The reason, we apprehend, is that sufficient facts are not in human possession as yet to clear up the point. Why not then suspend the assumption and seek facts? There is no doubt a certain length, which known facts warrant our reason to go on this subject of the interior of the earth, but nothing like the monstrous strides taken by our present writers on geology. Even Virgil the poet was more modest than these. For although he located the heathen Tartarus in the bowels of the earth, yet he left a solid causeway to it, and placed Elysium just beyond.

Nor is the reasoning upon subterranean forces more logical or conclusive to our mind. Granting the premises, the conclusions drawn from them are feeble and impotent. The earth is a sphere many thousands of miles in diameter. Geology supposes it to have a crust ten miles in thickness, the interior of which is in a fusible condition in consequence of internal heat. What are the chief effects of this condition? A few hundred volcanoes, which are as grains of sand compared with the volume of the earth, spout forth lava, most of them at intervals; upheavals of strata are seen on every hand; large districts of land are found to have imperceptibly risen or subsided in long periods of time.

These are the chief conclusions demanded from premises which make our globe a womb of subterranean forces, and a degree of heat beyond the conception of man's intellect. The conclusions are a failure upon such premises. They are a failure, too, inasmuch as there is an effort made by all recent writers with whom we are acquainted, especially the two before us, to show that the action of these subterranean forces is slow, steady, gradual, and free from violent shocks and concussions, however great may be their effects. Read the following from Sir Charles Lyell :—

SLOW UPHEAVAL AND SUBSIDENCE.

"Recent observations have disclosed to us the wonderful fact, that not only the west coast of South America, but also other large areas, some of them several thousand miles in circumference, such as Scandinavia, and certain archipelagoes in the Pacific, are slowly and insensibly rising; while other regions, such as Greenland, and parts of the Pacific and Indian Oceans, in which atolls or circular coral islands abound, are as gradually sinking. That all the existing continents and submarine abysses may have originated in movements of this kind, continued throughout incalculable periods of time, is undeniable, and the denudation which the dry land appears every where to have suffered, favors the idea that it was raised from the deep by a succession of upward movements, prolonged throughout indefinite periods. For the action of waves and currents on land slowly emerging from the deep, affords the only power by which we can conceive so many deep valleys and wide spaces to have been denuded as those which are unquestionably the effects of running water.

"But perhaps it may be said that there is no analogy between the slow upheaval of broad plains or table-lands, and the manner in which we must presume all mountain-chains, with their inclined strata, to have originated. It seems, however, that the Andes have been rising century after century, at the rate of several feet, while the Pampas on the east have been raised only a few inches in the same time. Crossing from the Atlantic to the Pacific, in a line passing through Mendoza, Mr. Darwin traversed a plain 800 miles broad, the eastern part of which has emerged from beneath the sea at a very modern period. The slope from the Atlantic is at first very gentle, then greater, until the traveller finds, on reaching Mendoza, that he has gained, almost insensibly, a height of 8000 feet. The mountainous district then begins suddenly, and its breadth from Mendoza to the shores of the Pacific, is 120 miles, the average height of the principal chain being from 15,000 to 16,000 feet, without including some prominent peaks which ascend much higher. Now all we require to explain

the origin of the principal inequalities of level here described, is to imagine, first, a zone of more violent movement to the west of Mendoza, and, secondly, to the east of that place, an upheaving force which died away gradually as it approached the Atlantic. In short, we are only called upon to conceive that the region of the Andes was pushed up four feet in the same period in which the Pampas near Mendoza rose one foot, and the plains near the shores of the Atlantic one inch. In Europe, we have learnt that the land at the North Cape ascends about five feet in a century, while further to the south the movements diminish in quantity first to a foot, and then, at Stockholm, to three inches in a century, while at certain points still further south, there is no movement.

"But in what manner, it is asked, can we account for the great lateral pressure which has been exerted not only in the Andes, Alps, and other chains, but also on the strata of many low and nearly level countries? Do not the folding and fracture of the beds, the anticlinal and cynclinal ridges and troughs, as they are called, and the vertical, and even sometimes the inverted position of the beds, imply an abruptness and intensity in the disturbing force wholly different in kind and energy to that which now rends the rocks during ordinary earthquakes? I shall treat more fully in the sequel (end of chap. 32) of the probable subterranean sources, whether of upward or downward movement, and of great lateral pressure; but it may be well briefly to state in this place that in our own times, as, for example, in Chili, in 1822, the volcanic force has overcome the resistance, and permanently uplifted a country of such vast extent that the weight and volume of the Andes must be insignificant in comparison, even if we indulge the most moderate conjectures as to the thickness of the earth's crust above the volcanic foci.

"To assume that any set of strata with which we are acquainted are made up of such cohesive and unyielding materials, as to be able to resist a power of such stupendous energy, if its direction, instead of being vertical, happened to be oblique or horizontal, would be extremely rash. But if they could yield to a sideway thrust, even in a slight degree, they would become squeezed and folded to any amount if subjected for a sufficient number of times to the repeated action of the same force. We can scarcely doubt that a mass of rock, several miles thick, was uplifted in Chili in 1822 and 1835, and that a much greater volume of solid matter is upheaved wherever the rise of the land is very gradual, as in Scandinavia, the development of heat being probably, in that region, at a greater distance from the surface. If continents rocked, shaken, and fissured, like the western region of South America, or very gently elevated, like Norway and Sweden, do not acquire in

a few days or hours an additional height of several thousand feet, this can arise from no lack of mechanical force in the subterranean moving cause, but simply because the antagonist power, or the strength, toughness, and density of the earth's crust is insufficient to resist, so long, as to allow the volcanic energy an indefinite time to accumulate. Instead of the explosive charge augmenting in quantity for countless ages, it finds relief continuously, or by a succession of shocks of moderate violence, so as never to burst or blow up the covering of incumbent rock in one grand paroxysmal convulsion. Even in its most energetic efforts it displays an intermittent and mitigated intensity, being never permitted to lay a whole continent in ruins. Hence the numerous eruptions of lava from the same vent, or chain of vents, and the recurrence of similar earthquakes for thousands of years along certain areas or zones of country. Hence the numerous monuments of the successive ejection and injection of melted matter in ancient geological epochs, and the fissures formed in distinct ages, and often widened and filled at different eras.

"Among the causes of lateral pressure, the expansion by heat of large masses of solid stone intervening between others which have a different degree of expansibility, or which happen not to have their temperature raised at the same time, may play an important part. But as we know that rocks have so often sunk down thousands of feet below their original level, we can hardly doubt that much of the bending of pliant strata, and the packing of the same into smaller spaces, has frequently been occasioned by subsidence. Whether the failure of support be produced by the melting of porous rocks, which, when fluid, and subjected to great pressure, may occupy less room than before, or which, by passing from a pasty to a chrystalline condition, may, as in the case of granite, according to the experiments of Deville, suffer a contraction of 10 per cent., or whether the sinking be due to the subtraction of lava driven elsewhere to some volcanic orifice, and there forced outwards, or whether it be brought on by the shrinking of solid and stony masses during refrigeration, or by the condensation of gases, or any other imaginable cause, we have no reason to incline to the idea that the consequent geological changes are brought about so suddenly, as that large parts of continents are swallowed up at once in unfathomable subterranean abysses. If cavities be formed, they will be enlarged gradually, and as gradually filled. We read, indeed, accounts of ingulfed cities and areas of limited extent which have sunk down many yards at once; but we have as yet no authentic records of the sudden disappearance of mountains, or the submergence or emergence of great islands. On the other hand, the creeps in coal

mines* demonstrate that gravitation begins to act as soon as a moderate quantity of matter is removed even at a great depth. The roof sinks in, or the floor of the mine rises, and the bent strata often assume as regularly a curved and crumbled arrangement as that observed on a grander scale in mountain-chains. The absence, indeed, of chaotic disorder, and the regularity of the plications in geological formations of high antiquity, although not unfrequently adduced to prove the unity and instantaneousness of the disturbing force, might with far greater propriety be brought forward as an argument in favor of the successive application of some irresistible but moderated force, such as that which can elevate or depress a continent.

"In conclusion, I may observe that one of the soundest objections to the theory of the sudden upthrow or downthrow of mountain-chains is this that; it provides us with too much force of one kind, namely, that of subterranean movement, while it deprives us of another kind of mechanical force, namely, that exerted by the waves and currents of the ocean, which the geologist requires for the denudation of land during its slow upheaval or depression. It may be safely affirmed that the quantity of igneous and aqueous action,—of volcanic eruption and denudation,—of subterranean movement and sedimentary deposition,—not only of past ages, but of one geological epoch, or even the fraction of an epoch, has exceeded immeasurably all the fluctuations of the inorganic world which have been witnessed by man. But we have still to inquire whether the time to which each chapter, or page, or paragraph of the earth's autobiography relates, was not equally immense when contrasted with a brief era of 3000 or 5000 years. The real point on which the whole controversy turns, is the relative amount of work done by mechanical force in given quantities of time, past and present. Before we can determine the relative intensity of the force employed, we must have some fixed standard by which to measure the time expended in its development at two distinct periods. It is not the magnitude of the effects, however gigantic their proportions, which can inform us in the slightest degree whether the operation was sudden or gradual, insensible or paroxysmal. It must be shown that a slow process could never in any series of ages give rise to the same results."

One word more upon this point, and we leave it. We object to subterranean forces because they may be in part unnecessary to produce the results ascribed to them. Let us be understood. We cannot ascribe to subterranean forces those great results assigned to them in the pages of these writers, whilst there may be in ope-

* See Lyell's Manual of Elementary Geology, chap. v.

ration a force capable of producing the same results, and whose laws are to some extent recognized and known. If our theories are to be founded on what we know, and not upon our ignorance, this doctrine of subterranean forces is destined to undergo great modifications.

During late years, the attention of geologists generally has been directed largely to particular departments of the science. Some of the formations and petrifactions have been investigated with great industry. Our knowledge in these branches has made great progress, while in others it remains indefinite. Of this number, we allude particularly to natural philosophy as applied to geology. The action of mechanical forces has too often been investigated by writers unfamiliar with the principles and action of such forces through experience. Hence, their treatises may read well to those of as little experience as themselves, while they will not stand the test of a practical scrutiny. To use the words of an old miner, "Geology has not yet had its Sir Isaac Newton."

There are many topics of interest which we should be pleased to notice in the work of Sir Charles Lyell. But our limits will compel us to close with only one more extract. It relates to the method of investigation pursued by the earlier geologists:—

"I shall now conclude the discussion of a question with which we have been occupied since the beginning of the fifth chapter; namely, whether there has been any interruption from the remotest periods, of one uniform system of change in the animate or inanimate world. We were induced to enter into that inquiry, by reflecting how much the progress of opinion in geology had been influenced by the assumption that the analogy was slight in kind, and still more slight in degree, between the causes which produced the former revolutions of the globe, and those now in every-day operation. It appeared clear that the earlier geologists had not only a scanty acquaintance with existing changes, but were singularly unconscious of the amount of their ignorance. With the presumption naturally inspired by this unconsciousness, they had no hesitation in deciding at once that time could never enable the existing powers of nature to work out changes of great magnitude, still less such important revolutions as those which are brought to light by geology. They, therefore, felt themselves at liberty to indulge their imaginations in guessing at what *might be,* rather than inquiring *what is*; in other words, they employed themselves in conjecturing what might have been the course of nature at a remote period, rather than in the investigation of what was the course of nature in their own times.

"It appeared to them more philosophical to speculate on the possibilities of the past, than patiently to explore the realities of the present; and having invented theories under the influence

of such maxims, they were consistently unwilling to test their validity by the criterion of their accordance with the ordinary operations of nature. On the contrary, the claims of each new hypothesis to credibility appeared enhanced by the great contrast, in kind or intensity, of the causes referred to, and those now in operation.

"Never was there a dogma more calculated to foster indolence, and to blunt the keen edge of curiosity, than this assumption of the discordance between the ancient and existing causes of change. It produced a state of mind unfavorable in the highest degree to the candid reception of the evidence of those minute but incessant alterations which every part of the earth's surface is undergoing, and by which the condition of its living inhabitants is continually made to vary."

ART. VII. VIEWS ON AMERICAN MINES AND MINERALS.—BY CHARLES S. RICHARDSON, CIVIL AND MINING ENGINEER, LONDON AND NEW-YORK.

IN laying before the readers of the "Mining Magazine" a description of the mineral resources of this part of the country, it may be advisable in the outset to preface my remarks with some explanation of the motive I have in view for devoting my time to the subject. In the spring of the present year, among my other professional engagements was one to inspect some mining property in the State of New-York, which said property had made some considerable stir among the speculators of the Hall of Commerce in London. The specimens sent over were very rich, and the report of the mine still richer; insomuch so, that they were looked upon as being "too good to be true." It has now become a notorious fact, and one which is much to be deplored, that a great deal of exaggeration and misrepresentation has been made of the mines in this country, and the result of this is, that nearly all reports on mineral properties which hold out more than a common prospective value, are received in England as doubtful; consequently, there is an absence of confidence between the English capitalist and the American mineral landowner. Truth is inseparable from mutual interest, and no permanent good can accrue to individuals or communities, where unfair means are resorted to for obtaining profitable results. This matter has engaged the attention, for some time past, of several

gentlemen connected with the mining industry of this and the mother country. They conceive that there is a link wanted in the great chain that is presently to connect the mining interests of the two nations. Discussions have taken place, and several plans been suggested ; but, through want of publicity, nothing as yet has been positively effected to consummate an end so devoutly to be wished. The "Mining Magazine," if I understand it rightly, is to be the chronicle of the mineral prospects and prosperity of this country ; that its pages are open to receive the literary contributions of all practical mining men ; that its public success depends on the veracity of the information it imparts, and that its proprietors will use every effort to keep it respectable. Admitted, then, that we are to receive monthly, an account of mineral property, on which the strictest reliance can be placed, I think we shall have gone one step in the right direction to establish public confidence. The next thing that occurs to me as one of great importance, is the style of description.

Now, the English mining capitalist prefers, wherever it is attainable, a report of the property in which he is going to invest, given in plain Cornish. But, between the classic phraseology, commonly used in reports given by the geologist, and the unconnected, loose diction of the practical miner, there exists such a contrast, that in many instances they are in no way identical, although their meaning when understood is the same. Here is a difficulty that has been much felt between the two parties, and no one as yet, that I am acquainted with, has been intrepid enough to suggest a plan to simplify the one or elucidate the other. Now, I conceive that a line should be drawn between the two, that those tortuous German words should be expunged, or so modified as to render them into plain English. How this is to be done, I am at present not able to say ; but that much can be done with a little time and patience, I am fully assured of. In a future paper I intend to outline a plan, and with it to give a description of the "cost book system," with other mining laws and customs of the old country. In the mean time, probably, others will take up the subject, and thus, by a combination of ideas, much information will be attained.

Since my short sojourn in this country, I have had the pleasure of making the acquaintance of many gentlemen of the highest integrity connected with the mining interest, who entertain the same views relative to the formation of a systematic plan of mining operations as I do myself.

I have been over properties, the mineralogical characteristics of which are such as to warrant the outlay of a large amount of capital. These properties are of inestimable value, but they are not publicly known. Some of them, before I return to England, I

hope to be able to give a description of, through the medium of the magazine. I must confess I have felt much astonished at what I have seen, and so pleased am I at the prospect of American mining, that I already have an inkling to indentify myself with its future prosperity.

THE NORTHAMPTON DISTRICT.

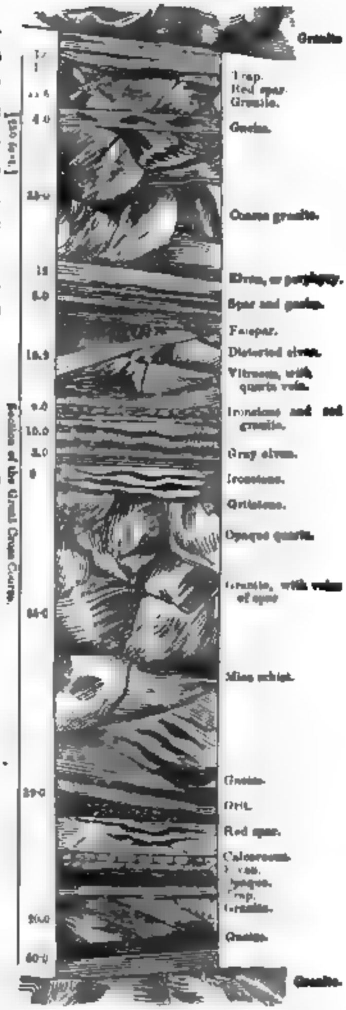
The property I have selected to notice first, is situated in the townships of Northampton, Easthampton, Southampton, and Westhampton, in the county of Hampshire, Commonwealth of Massachusetts, and embraces an area of some 10,000 acres. It lies in 42° 12′ north latitude, and 72° 36′ west longitude, or 5° 36′ east of Washington, and 10 miles to the west of Mount Holyoke. It is principally between the northwestern and southern branches of the Manhan river, a small mountain stream that empties itself into the great Connecticut River. There are two mountain ranges running nearly north and south parallel with each other; the one on the western side is entirely granite, the other sandstone. The intervening valley is about five miles in width, which is all sandstone and conglomerate, except in some few isolated parts where the granite crops out at surface. The average of the beds are nearly horizontal, regular, fine-grained, and compact at bottom: but coarse, pebbly, and mixed with large boulders near the surface; the floor joints are composed of shale, with slight traces of coal. They have much the appearance of certain localities in Glamorganshire in South Wales, and we may not be surprised if beds of bituminous coal will some day be found in the lower part of the valley. Should it prove so, the coal measures will be of immense extent. It is very evident these sedimentary beds were of slow formation, and have been ever since their deposition in a tranquil state; for in no one instance have I found any volcanic distortion in the strata; the slight dip of the beds as seen where excavations have been made, is no more than is due to the natural subsidence of the superincumbent mass consequent on their pressure into a lower elevation of the valley. As regards the depth of the sandstone formation, we have no data to found any calculation on; but if I were to judge the depth from the mountain slopes in the Loudville Valley, I should not put them down at more than about 50 feet; of course they are much deeper as they approach the Connecticut River. The sandstone overlaps the granite; or in some instances, in consequence of its abrupt nature, abuts up against it. The primary rock here consists of three kinds of granite: the gray compact, the coarse micaceous, and the quartzoze. Trap bands occur in the vicinity of the lodes and cross courses; where, with the latter, in connection

with gneis and porphyry, they form regular elvan dykes, but not metalliferous. The compact granite is of a very beautiful nature, much similar to the granite obtained from the quarries at Luxullian, near St. Austle in Cornwall, a locality proverbial for some of the richest copper mines in the eastern part of the county, viz., old Crinnis Mine, Lanisket, Par Consols, and others. There is nothing particularly worthy of notice in the crystalline rocks of this district, more than the gradual transition from coarse and soft, to fine and hard, which will be duly treated in an illustrated geological paper hereafter. That they were at a period when immerged, in a very precipitous and ragged form, is evident; but those asperities are now rounded off by the abrasion of the atmosphere, and from their local position, as now seen, their early history may very easily be gleaned. The mountains are not very lofty, the highest being only about 1200 feet above sea level; they are covered with wood up to their summits. For agricultural purposes, I should apprehend they were poor, but for minerals, immensely rich.

We now pass on to the mineral department. About the centre of the district there exists one of the most extraordinary geological phenomena that has come under my notice since I have been in this country, viz., the existence of an immense cross course. I say an extraordinary cross course, on account of its immense size, and the regularity of its stratification and meridional bearing. It is an elvan dyke of great magnitude; its underlay, if any thing, is not more than one foot in the fathom, or at an angle of 80° with the horizon; its bearing is north and south, although in places it appears to have a traverse of 8° to the westward; its most peculiar features are its regular strata. It is composed of all the secondary crystalline rocks, which have been subjected to a highly igneous influence, such as trap, gneis, gritstone, red quartz, gray elvan (compact porphyry), blue elvan or winstone, iron, and opaque quartz, quartz crystals, calcareous spar, and quartzose rock. In tracing its course along on the back, we find innumerable small quartz veins branching out from it. Some are metalliferous, containing argentiferous (silver lead) ore, others with traces of copper. They run in all directions; some of them have the appearance of lodes, carrying a gossan with two walls, and it is probable some may be small lodes; but generally it will be found they are nothing more than the clevage planes common to the primary rocks of this country. This great cross course now becomes the dam, and has been the means of intercepting the flow of all the minerals in this district. I conceive it satisfactorily accounts for those fine deposits of ore so near the surface in the mines now working on both sides of it; where it is cut through at Kingsley Bridge on the Northampton road, a small

branch made a quantity of ore immediately on its intersection with the elvan. It is the elvan and cross courses that have made all the rich mines in Cornwall; and, as far as I can see, the only material difference that exists between this new mining district and Cornwall, is, that there the strata is granite overlapped by the (killas) clay slate, while here it is granite overlapped by sandstone. It might be said, probably, that the latter is of too recent a formation to contain mineral deposits. I fully believe there is no ore bearing lodes in the sandstone at all in this district. In my explorations, as far as I have gone, I have not seen any trace of such. The sand beds, particularly near the surface, contain many shode stones, full of lead, but these have been detached from the lodes and rolled down into the valleys, where they have become embedded, and now form part of the strata, others are still loose; in fact, the benches on the slopes of the mountain are full of them, and many persons have thought they had got a mine in their land through finding a quantity of those stones. The lodes here are all in the granite, which can be easily seen by tracing down one of them across the country. It will be found to crop out at the surface on the hill sides, and then it is lost in the valley until it makes its appearance again on the opposite hill, when it continues its regular course. Now, if the lode (to use a Cornish expression) "made" in the sandstone while crossing the valley, it would have shown itself by a surface gossan, flucan, or other mineral indication; but no such a thing exists. Hence, I will infer that all the lodes are in the primary formation, and do not exist at all in the sedimentary beds. I have been very careful in delineating the structure of the cross course, or elvan dyke, as it is destined to figure very prominently in the

ORDER OF THE STRATA.



Scale fifty feet to the inch.

mineralogical features of this district. Those who may be interested in mining property in this neighborhood I should advise to turn their attention to it, as its presence will influence the value of all lodes that are near it.

THE LODES.

At this early stage of mining operations, but little is known of the existing lodes of the district. That there is a channel of mineral ground passing from about 25° northeast to 25° southwest, is evident to every mining man that walks over the surface, but the number of lodes contained therein no one can tell. There have been three lodes discovered, one on the north side, and two on the south side of the great cross course; each of those lodes are what is denominated in Cornish, champion lodes, that is to say, they are the master lodes, to which all parallel ones in the vicinity are subservient, and others contributaries. They have respectively been opened on in the Northampton mines at Northampton—a mine now in full operation by a New-York company—at the Loudville mine at East Hampton, working under Captain Pinck from Cornwall, by the Hampshire Consolidated Mining Company; and the Lavinia mine at Southampton, by a private local mining firm. Each of these mines will be separately treated in another number, space will not admit of it in this. The two last named lodes are counters (diagonals) to the cross course, running about 20° northeast; they are very productive quite up to the surface, carrying a strong leader of lead ore; they are large and regular in their bearing, and those at the Loudville Mine are regular in their underlay, notwithstanding they carry lead throughout, and to the superficial observer may be called lead mines, yet they will be pronounced copper lodes by the miner. This, perhaps, may appear somewhat incongruous to the general reader; but I will explain the matter thus: in England, many of the copper lodes carry lead on their backs for many fathoms in depth, the lead near the surface being the predominating mineral; in depth the lead gradually wears out, and the lode becomes one entirely or nearly so of copper. Again, all lead lodes, and particularly those that have an easterly and westerly direction, carry copper and pyrites of copper on their backs, which generally wears out in depth. Tin lodes nearly always carry copper on their backs; but it is very seldom, and I have never heard of but one instance of any note, in which lead was found on the back. The question next arises how the products of a lode can be ascertained, for surely a tree is known by its fruit? Very true; but we must first see the fruit. An oak tree first produces in the spring the oak-apple, but in the autumn comes the acorn, both are fruits

from the same tree, but the distinctive difference is, that one is merely the efflorescence, while the other is the real fruit; the former dies away in its season, while the latter is the perpetuating germ of life. So it is with the lodes of lead and copper, the fruits—gossan, or other foreign associated minerals they carry on their backs, are merely the spring flowers (the efflorescence), which in depth, like in time, die away—leaving, like the acorn on the oak the real fruit. It is frequently asked, and very naturally so, how does the miner tell the nature of the lode? To satisfactorily answer this question would take an entire volume, and so far as my knowledge extends about the matter, the reader might be just as far off when he finished the last page as when he began. It is a kind of inductive knowledge, an instinct, known only to himself, and which can only be learned from the great store-book of nature.

About two miles to the west of Loudville, in the township of Westhampton, is another run of lodes. Some of them are nearly east and west on a course towards Loudville. Should they hold on as strong as they appear there, they will intersect the great cross course in about the vicinity of Kingsley Bridge, or a little higher up the river. Where this junction takes place there will be a great deposit of mineral; there will also be a run of parallel lodes found on the eastern side, lower down the valley. These lodes will come about under the town of Southampton; they will be found to lie deeper than those on the northern side.

I have an idea that the lead lode of the Lavinia Mine is one of the eastern lodes. It is of a very different nature from the others, containing fluor spar, and barytes; while in the Loudville mine I have not detected any fluor spar. I consider it a lead lode. Now, as to the value of these lodes, we have no data to ground a calculation upon; no shaft has been sunk below water level, and the ancient workings are so shallow that they only go to prove the existence of surface minerals, the dip, and bearing of the lodes. It would be premature in any one to say they will positively be productive; but that they hold out promising assurance of such from their external indications, any person accustomed to mineral surveying, must admit. I fully and sincerely believe that this district is destined in a very few years to become one of great importance; the mines here will not be rich, but they will be deep, and I think productive; they are not mines for the speculator, they are only suitable for those who have a desire for legitimate mining; for the permanent investment of capital. It would be a good spot to give a demonstration of American mining with American enterprise; such an effort would not only be one of personal, but national credit. It would be the pioneer of the mines: it would transform this quiet, secluded spot among

the mountains into the abode of busy industry; powerful steam engines with their tall stacks would range from the valley to the hill top, along the line of the great lodes; the scattered hamlet become a populous village, and the long hidden mineral wealth of the mountains be daily brought to light, diffusing labor, happiness, contentment, and competence among hundreds of families, and fulfilling the great purpose for which they were designed and reserved, viz., for the use of man.

To be Continued.

Art. VII. THE BLOW-PIPE, AND ITS USE IN CHEMICAL ANALYSIS.*

D, BLOW-PIPE REAGENTS.

In most experiments with the blow-pipe, a very small number of reagents need be made use of, and of these very small quantities will suffice. There are but three principal reagents which are in extensive use.

1. *Soda.*—Dry carbonate of soda, which, when used for certain purposes, must be free from sulphuric acid. Soda is chiefly useful in facilitating the reduction of metallic oxides and sulphurets on coal, in separating silicates, and in determining the solubility or insolubility of a body when in fusion with it.

2. *Borax.*—Purified borax, freed by heating from the greatest part of its water, and then pulverized. When used, the point or bowl of the platinum wire, after being heated to a red heat, is thrust into this powder, and what adheres to it is melted by means of the blow-pipe; this is repeated until the bowl is filled with a melted bead, perfectly clear and colorless, both when hot and cold. The borax bead, while yet soft, is brought into contact with the substance to be tested in a powdered state, so that a suitable quantity of it adheres to the bead, and in this way can be subjected to the influence of the fused borax before the blow-pipe. The solubility or insolubility of the substance, but more especially the colors of the borax beads produced in the oxidating and reducing flames, may then be observed.

3. *The double Phosphate of Soda and Ammonia.*†—As it cannot be conveniently fused immediately on the bowl of the platinum wire (on account of its liability to fall off in drops so long as ammonia and water escape from it), it is first melted on charcoal, by gradually heating it to a bead, in which the bowl of

* Continued from the October number of the "Mining Magazine."

† Called also *microcosmic salt.*—Trans.

the platinum wire is thrust. It is used in precisely the same manner as borax.

Besides these three principal reagents, there are several others used in certain cases. Thus nitre is used in oxidating fusions; the bisulphate of potash, in expelling and detecting certain volatile substances (as lithium, boracic acid, nitric acid, hydrofluoric acid, bromine, iodides), and also in separating the acids of titanium, and wolfram: the nitrate of cobalt, chemically pure, and in solution, especially for reaction upon clay, magnesia, oxide of zinc, oxide of tin, and titanic acid; which, when moistened with the solution of cobalt, and heated, assume certain characteristic colors. Silica is used for various purposes. Fluor spar, mixed with a certain quantity of bisulphate of potash, is used in detecting lithium and boracic acid, the oxide of nickel, or oxalate of nickel, in detecting a larger proportion of potash in salts, which also contain soda and lithium; oxide of copper, in detecting chlorine, bromine, and iodines; tin employed in the form of tin-foil, in facilitating the reduction of a substance dissolved in borax, or in microcosmic salt. The bead, while yet warm upon the charcoal, is touched with the tin-foil, so that a little of it remains adhering to the bead, and it is then subjected for a short time—a few seconds—to the strongest possible reducing flame. Silver, in sheet or plate form, is useful in detecting sulphur and sulphuric acid.

Blow-pipe reagents are best kept in glass vials, tightly closed, and provided with ground stoppers, and these should be packed in a suitable wooden box. It should be so arranged, that in travelling, the motion do not cause the glass stoppers to get loose or fall out.

E, OTHER ARTICLES USED IN BLOW-PIPE EXPERIMENTS.

The use of these is obvious, and they are rather useful than indispensable. We need only mention a *hammer*, a small *anvil*, a steel *mortar* (for breaking into small pieces), an *agate-mortar*—several files of different kinds—a *knife, shears, magnet, magnifying glass*, &c.

ART. VIII. MINERALOGICAL EXHIBITION IN THE CRYSTAL PALACE, NEW-YORK.

MORE than three months have now passed away since "The New-York Exhibition of the Industry of all Nations" was opened to the public, and our pages have not yet contained any report upon its Mineralogical Department. Fearing the condemnation of our readers for such an apparent neglect, to bestow that attention

which might be due to so important a part of a "great national enterprise" (as the public papers term it), we feel it to be requisite to state the reasons of the course we have pursued.

The first edition of the catalogue of the Exhibition contained nothing in reference to the Mineralogical Department, except a promise of its future arrangement and the publication of a catalogue of the same. On the first of October, a new and revised edition of the general catalogue appeared, and we were surprised to find again in it this remark: "The arrangement of the collection (of minerals, etc.) requires considerable time, but is being completed as rapidly as possible. A supplementary catalogue of the department will be published when the cabinet is open to the public."

Finally, after all the other contributions to the Exhibition had for months been arranged, and some of them even removed, and after numerous articles have begun to show the marks of the curious disposition of their examiners, the Mineralogical Department was thrown open in an unarranged condition, and without the accompaniment of the long promised catalogue. At the end of the first week, and even at the end of the first three weeks afterwards the collection still remained unarranged, and no catalogue was to be had.

The contributions of our own country form, of course, the greatest part in number of the collection. Here, the visitor will see many large and splendid specimens from some of our mines and coal fields, a great number of rich pieces of ore, rare minerals, and petrifactions; also a display of gold ores and bars of a value of more than $28,000 under glass cases, but he will seek in vain for particulars to enable him to form an idea of the geological formations and mineral resources of the different States of our Union. He will see the glass cases with cards attached, bearing the names of "Pennsylvania," "Maryland," "New-York," etc., and a number of specimens are labelled with the names of mining companies and private individuals, and here and there we were happy to find a mineral with its own name attached. Simple rocks, pieces of the great bulk of our globe, "samples of the country," which the geologist is always looking for in addition to those mineralogical fruits and flowers in the shape of ores and crystals, seem in general to be considered of too little importance to find a place in the collection. What we expected to find was a systematically arranged collection of all minerals of our country, each one bearing its name upon it, for the purpose of information to the people and to serve as contributions to science. But what we found was a "fine show," a splendid display of valuable ores and "rarities." As to the arrangement, the German collection would have served as an admirable guide to a scientific method.

After all, our judgment of the Exhibition may be premature. There is time yet for much to be done, for it is not expected the Exhibition will close on the first of December. We shall, therefore, wait with all due patience for the fulfilment of the promises made respecting this important department.

A. P.

JOURNAL OF MINING LAWS AND REGULATIONS.

AN ACT OF THE LEGISLATURE OF PENNSYLVANIA TO ENCOURAGE THE MANUFACTURE OF IRON WITH COKE OR MINERAL COAL, AND FOR OTHER PURPOSES.

I. When any number of persons, citizens of the commonwealth, are associated for the purpose of making and manufacturing iron from the raw material with coke or mineral coal, and shall be desirous to acquire and enjoy the powers and immunities of a corporation, or body politic in law, and shall have subscribed a sum not less than one hundred thousand dollars, nor more than five hundred thousand dollars, in such shares as they may agree upon, not exceeding fifty dollars each, and actually paid in to such persons as they may have appointed for that purpose the one-fourth of the capital stock so subscribed, it shall or may be lawful for such persons to prepare an instrument in writing, therein specifying the objects, articles, and conditions, and name, style, or title, under which they have associated, and the counties in which they intend to purchase or have purchased land for such making and manufacturing of iron with coke or mineral coal, the amount of capital stock subscribed, the amount of the shares in which it is subscribed, and the amount which shall have been paid in, and the same to exhibit to the attorney-general of the commonwealth for the time being, who is hereby required thereupon to examine the said instrument, and after such examination to transmit it with a certificate thereon indorsed, testifying his opinion touching the lawfulness of the objects, articles, and conditions, therein set forth and contained, to the governor of the commonwealth, who shall thereupon examine the said instrument, and if he shall be satisfied of the lawfulness of the objects, articles, and conditions therein set forth and contained, and that the capital stock of the said association or corporation, to an amount not less than one hundred thousand dollars, has been bona fide subscribed, and the one-fourth thereof actually paid in, then the governor shall certify the same to the secretary of the commonwealth, with an order requiring him to enroll the same at the expense of the applicants; and upon the enrollment thereof, the persons so associated shall, according to the objects, articles, and conditions in the said instrument, become a corporation or body politic in law and in fact, to have continuance by the name, style, and title in such instrument provided and declared. *Provided*, always, that no corporation created by virtue of this act shall continue longer than twenty-five years from the time of its creation.

II. The affairs of the said corporation shall be managed by directors to be chosen annually from the stockholders; the first election shall be held within thirty days after the letters-patent aforesaid shall have been issued, of which election public notice shall be given at least two weeks previously thereto, in two or more daily newspapers, and the subsequent elections shall be held annually at such convenient time and place as the directors shall determine, of which thirty days' previous notice shall in like manner be given. *Provided*, that in the event of a failure to hold such election, the former directors may continue in office for a period not exceeding six months, or until such election shall be held.

III. The election for directors shall be held by ballot, and each stockholder shall be entitled to vote according to the number of shares held by

said stockholders, in the proportion following, that is to say,—for each share and not exceeding two shares, one vote; for every two shares above two and not exceeding ten shares, one vote; for every four shares above ten, and not exceeding thirty, one vote; for every ten shares above thirty, and not exceeding one hundred, one vote; for every twenty shares above one hundred, one vote. No share shall confer a right of voting which shall have been transferred within three calendar months prior to the day of election, nor unless it be bona fide held or owned by the person in whose name it appears in his own right, or that of his wife, or for his or her sole use and benefit, or as executor or administrator, trustee or guardian, or in the right or for the use and benefit of some copartnership, society, or corporation, of which he or she may be member; and all votes by proxy shall be on such terms and conditions as are prescribed by the act passed on the twenty-eighth day of March, one thousand eight hundred and twenty, entitled, "An Act to regulate proxies." *Provided also*, that the stockholders in the corporation to be created under this act shall be individually liable for the amount of capital stock by them respectively subscribed, in such corporations, which shall not have been paid in. *And provided further*, that if said corporation shall at any time contract debts to a greater amount than that of the capital subscribed, such corporation shall forfeit its charter, and its corporate powers shall cease and determine.

IV. As often as corporations established by virtue of this act and the successors thereof respectively, shall be desirous of improving, amending, or altering the articles and conditions of the instrument upon which corporations respectively are as aforesaid formed and established, it shall be lawful for such corporations respectively in like manner to specify the improvements, amendments, or alterations which shall be desired, and the same to exhibit to the attorney-general and governor of this commonwealth, and the same being certified as aforesaid to be lawful, shall in like manner be directed by the governor to be enrolled by the secretary of the commonwealth at the expense of the applicants, and upon the enrollment thereof shall be taken and deemed a part of the instrument upon which such corporations respectively were formed and established, to all intents and purposes as if the same had originally made part thereof.

V. The corporations established by virtue of this act, and the successors thereof respectively, shall have full power and authority to make, have, and use one common seal, with such device and inscription as they shall respectively deem proper, and the same to break, alter, and renew at pleasure, and by the name, style and title by them respectively provided and declared as aforesaid, shall be able and capable in law to sue and be sued, plead, and be impleaded, in any court, before any judge or justice, in all manner of suits, complaints, pleas, causes, matters, and demands whatsoever, and all and every matter and thing therein to do in as full and effectual a manner as any other person or persons, bodies politic and corporate, within this commonwealth, may or can do, and shall be respectively authorized and empowered to make rules, regulations, and ordinances, and to do every thing needful for the good government and support of the affairs of the said corporation respectively; *Provided always*, that the said by-laws, rules, and ordinances, or any of them, be not repugnant to the constitution and laws of the United States, and to the constitution and laws of this commonwealth, or to the instrument upon which the said corporations respectively are, as aforesaid, formed and established.

VI. Each corporation established by virtue of this act, and the successors thereof respectively, by the proper name, style, and title, shall be able and capable in law, according to the terms and conditions of the instrument upon which the said corporations respectively are as aforesaid formed and established, to take, receive, and hold in fee simple, lands and tenements, not exceeding in the whole two thousand acres, in not more than three separate parcels, and the same to use and convey in fee simple; *Provided, however*, that such corporations shall not hold real estate in more than one county, or two counties which shall adjoin each other.

VII. The corporation established by virtue of this act, and the successors thereof, shall use and employ their moneys, lands, and tenements, in the making and manufacturing iron with coke or mineral coal, and in the transportation thereof to market, and vending the same, and for no other purposes whatsoever. Neither shall such corporation have or exercise any banking privileges, nor do any thing which may not be necessary for carrying on the business of the said company, in such making, manufacturing, transporting, and vending such iron; *Provided*, that nothing herein contained shall be construed to empower such corporations to manufacture iron which has not been manufactured from the ore with coke or mineral coal.

VIII. The corporation established by virtue of this act, shall annually, on or before the first day of December, in each and every year, make a return, attested by the oath of the president or secretary of such corporation, of the transactions of such corporation to the secretary of the commonwealth, who shall report the same to the legislature, in which return the said corporation shall state the amount of the said capital stock subscribed, and the amount of the same paid in, the number of acres of land held by it, the number and nature of the works used by it, and the quality and kind of iron made and manufactured by it during the current year.

IX. The stock of such corporations shall be assignable and transferable by the holders thereof to such persons as they may think proper, according to such rules as the by-laws shall prescribe; but no stockholder shall be permitted to transfer his stock while any instalment due thereon shall remain unpaid, except by a special order of the board of directors to that effect.

X. Dividends of so much of the profits of such corporations as shall appear advisable to the directors or managers, shall be declared twice in every year, and paid to the stockholders or their legal representatives on demand, at any time after the expiration of ten days therefrom, but they shall in no case exceed the amount of the net profits actually required by the said company, so that the capital stock shall never thereby be impaired; and if the said directors or managers shall make any dividend which shall impair the capital stock aforesaid, the directors or managers consenting thereto, shall be liable to said company in their individual capacity, for the amount of stock so divided; and each director present when such dividend is made, shall be adjudged consenting thereto, unless he forthwith enter his protest on the minutes of the board, and give public notice to the stockholders of the declaring of such dividend; *Provided*, that the said company or companies shall make an annual return of the amount of dividends, and they shall pay into the State treasury a tax of eight per cent. on all dividends where they shall declare dividends exceeding six per cent. per annum.

XI. It shall be lawful for the legislature at any time to amend, alter, or repeal this law, and amend, alter, or abolish any corporation or charter which may be created under it.

Passed, June 16th, 1836.

SUPPLEMENT TO THE ACT OF THE SIXTEENTH OF JUNE, ONE THOUSAND EIGHT HUNDRED AND THIRTY-SIX, IN CORPORATING COMPANIES TO MANUFACTURE IRON WITH MINERAL COAL AND COKE.

Be it Enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met,—

And it is hereby enacted by the authority of the same, that the provisions of the act of the sixteenth of June, 1836, entitled "An Act to encourage the manufacture of iron with coke or mineral coal, and for other purposes," be extended for the purpose of making and manufacturing iron from the raw material with charcoal; and all companies organized under the provisions of said act, to manufacture iron with charcoal as aforesaid, may hold timber lands not exceeding the quantity that will be required to furnish wood for charcoal, for

the purposes of the business of such companies, and said land may be located in not exceeding four contiguous counties, and such companies shall have authority to increase their capital to an amount not exceeding what shall be necessary for the legitimate business of the same.

Passed June 29th, 1852.

A FURTHER SUPPLEMENT TO THE ACT OF THE SIXTEENTH OF JUNE, 1836, ENTITLED "AN ACT TO ENCOURAGE THE MANUFACTURE OF IRON WITH COKE OR MINERAL COAL, AND FOR OTHER PURPOSES."

BE IT ENACTED by the Senate and House of Representatives of the Commonwealth of Pennsylvania, in General Assembly met,—

And it is hereby enacted by the authority of the same, that nothing contained in the act of the sixteenth of June, one thousand eight hundred and thirty-six, entitled "An Act to encourage the manufacture of iron with coke or mineral coal, and for other purposes," or in the supplement to said act approved the twenty-ninth day of June, one thousand eight hundred and fifty-two, entitled, "A supplement to the Act of the sixteenth of June one thousand eight hundred and thirty-six, incorporating companies to manufacture iron with mineral coal and coke," shall be so construed as to prohibit any company from being incorporated under such Act and Supplement thereto, both for the purpose of making iron from the raw material with charcoal, and for the purpose of making iron from the raw material with coke or mineral coal, and any such company shall have the privileges and be subject to the restrictions contained in said Act and Supplement thereto.

MUTUAL RIGHTS OF THE OWNER OF THE SOIL, AND THE OWNER OF THE MINERALS BENEATH.

AN interesting case (Humphreys v. Bragden, 1 English Law and Equity Reports, p. 240,) upon this subject recently arose in England. The plaintiff was the owner of a piece of land, beneath which was a coal mine leased and worked by the defendants. The defendants had taken out the coals without leaving sufficient pillars to support the surface, by means of which the land had swagged and sunk, and had been considerably injured. It appeared that if the surface and the mines had belonged to the same person, the mode of working had not been conducted carelessly or negligently, or contrary to the custom of the country. The finding of the jury was, that "the company had worked carefully and according to the custom of the country, but without leaving sufficient pillars or supports."

It was decided by the court that the owner of the soil was entitled to sufficient support to preserve the surface in its original and natural state. This rule must govern the rights of the parties, without regard to the relative value of the soil or the minerals. The case was considered to be analogous to that of a building, the different stories of which are owned by different owners, in which case the upper owners are entitled to the support of the lower stories. Lord Campbell, in delivering the opinion of the court, held the following language: "When there are separate freeholds, from the surface of the land, and the minerals belonging to different owners, we are of opinion that the owners of the surface while unincumbered by buildings, and in its natural state, are entitled to have it supported by the subjacent mineral strata. Those strata may of course be removed by the owners of them, so that a sufficient support for the surface is left; but if the surface subsides and is injured by the removal of those strata, although (on the supposition that the surface and the minerals belong to the same owner) the operations may not have been conducted negligently, nor contrary to the custom of the country, the owner of the surface may sustain an action against the owner of the minerals for the damage sustained by the subsidence. Unless

the surface close be entitled to this support from the close underneath, corresponding to the lateral supports to which it is entitled from the adjoining surface close, it cannot be securely enjoyed as property, and under certain circumstances, as where the mineral strata approach the surface, and are of great thickness, it might be entirely destroyed. We likewise think that the rule giving the right to the support of the surface upon the minerals, in the absence of any express grant, reservation, or covenant, must be laid down generally, without reference to the nature of the strata or the difficulty of propping up the surface, or the comparative value of the surface and the minerals. We are not aware of any principle upon which qualifications could be added to the rule, and the attempt to introduce them would lead to uncertainty and litigation. Greater inconvenience cannot arise from this rule in any case, than that which may be experienced where the surface belongs to one owner, and the minerals to another, who cannot take any portion of them, without the consent of the owner of the surface. In such cases, a hope of reciprocal advantage will bring about a compromise advantageous to the parties and the public. Something has been said about a right of reasonable support for the surface, but we cannot measure out degrees to which the right may extend, and the only reasonable support is that which will protect the surface from subsidence, and keep it securely at its ancient and natural level."

COMMERCIAL ASPECT OF THE MINING INTEREST.

Since our last, the transactions in mining stocks have been few, and generally at lower rates. North Carolina has fallen to 4, at which price it is now steady. The delay in the erection of their engine, and the consequent stoppage of the supply of ore, from sales of which a dividend was expected before this, has been the main cause of the fall. Those who are well informed on the subject say the mine was never looking better than at present. Mineral Company, in which there had been large speculations upon the probability of its having the North Carolina vein, has been sold as low as 25 cents per share. It has, however, reacted to 50 cents, at which price it is now stationary. The success which has attended the operations of the Pennsylvania and Lehigh Zinc Company in the manufacture of the white oxide of zinc, gave for a time a great impetus to their stock. It rose rapidly to 5½, but this figure brought out large quantities, and it has fallen to about 3, at which there are considerable transactions. The company say they are manufacturing the white oxide rapidly, and have established an agency in this city for its sale. Ulster stock has been in demand at $2½. The accounts from this mine are exceedingly favorable. The company are clearing $3000 per month from the sale of their lead. They have also on hand a large amount of copper ore, and expect to pay a handsome dividend in February next. The good accounts received from the Fulton mine gave for a time much activity to it. But the pressure for money induced parties who had determined to buy largely, to wait till money matters had taken a more favorable turn. The stock remains steady at $2, there being little disposition on the part of holders to realize at that figure. Phœnix Gold is also looking well. This stock has stood steadily at about $1, with but few transactions. The company are extracting gold from the ore with Chilian mills, and so far the results show they are more than paying expenses. They expect soon to have one of Berdan's

largest crushers and amalgamators at work, when the product from their mine may be largely increased. McCullough and Gold Hill have both fallen off somewhat in prices, though the accounts from the mines are exceedingly good, especially from the latter.

We have now noticed the mining stocks which are most actively dealt in at the board, with the exception of mineral companies, they have all maintained their prices fairly, considering the great demand for money, and the general necessity to sell in order to realize cash; of course, should financial affairs remain as at present, there can be no immediate or great rise; but, upon a favorable change, we have no doubt they will feel the effect as soon as any other class of stocks.

Fluctuations for September, 1853, *in the Mining Stocks during that month at the New-York Stock Exchange Board, showing their highest and lowest points, and the date, with the market value at the close of the month, gain or loss for the month, and number of Shares of each sold:*

Mining Stocks, New-York.	Shares.	Par Value.	Highest Sales.	Day Mo.	Lowest Sales.	Day Mo.	Value Sep. 30.	From Aug. 30. Gain.	From Aug. 30. Loss.	Shares Sold.
		$								
Cumberland Coal . .	50,000	. .	42½	8	37½	24	37	–	5	65,000
Dolly Hyde Copper . .	. . . .	. .	6	28	5¼	5	5	–	¼	1,150
Fulton Mining Company .	. . . .	. .	3¼	22	2	19	2½	–	¼	600
Great Northern Lead .	. . . .	. .	2¾	9	2½	10	2½	–	¼	1,750
Gold Hill .	. . . .	. .	5½	5	4	15	4½	–	1¼	8,500
Middletown Silver Lead .	. . . .	. .	1¼	10	1¼	19	1¼	–	¼	1,100
McCullough . . .	200,000	5	11½	1	9½	20	10	–	1¼	2,100
North Carolina, Copper .	100,000	5	7	1	6½	2	6¼	–	¼	300
New Jersey Zinc . .	. . . .	. .	11½	13	11	23	11½	–	¼	60,900
New Creek Coal . .	200,000	10	3	13	3	13	3	–	–	6,000
Parker Coal . .	80,000	100	20½	8	19½	24	19½	–	1	52,000
Pennsylvania Coal . .	60,000	50	111	8	110½	2	110	–	1	600
Phœnix Mining . .	. . . .	. .	8½	8	16½	9	17	–	2½	5,900
Phœnix Gold . . .	100,000	3	1½	13	1½	12	1½		¼	2,950
Potomac Copper . .	100,000	10	3	8	2½	29	2		1	500

IMPORTATION OF COALS AND METALS AT NEW-YORK FROM SEPTEMBER 16TH TO OCTOBER 14TH, 1853.

	Quantity.	Value.
Coals, tons,	11,878	$31,031
Iron, tons,	6,872	305,183
" Pig, tons,	7,765	124,198
" Railroad, tons,	98,804	660,686
Copper, pks.,	462	77,247
" sheathing pks.,	270	90,565
Lead, tons,	28,821	107,921
Steel,	6,249	130,476
Tin,	46,874	450,604
Zinc,	236	19,677

BOSTON MINING SHARE MARKET.

BOSTON, *Oct. 20th*, 1853.

The general features of the market have been dulness and inactivity for nearly all the *mining shares*, with a general desire by holders to realise, and

consequently shares have suffered largely in their current value. At no time for many months has there been so great an apathy prevailing in the stock market generally as within a few weeks past, and it cannot be expected that *mining stocks* should be exempt from the depressing influences brought to bear upon all other descriptions. Accounts from Lake Superior continue highly favorable, and most of the mines in active operation have been doing a very good business the present season. The shipments of copper will be large, and the mining interests never stood better than at the present time.

Assessments have been called for on several of the copper mining stocks, as follows:—

Companies.	Am't. per share.	When payable.	Where payable.
North Western, ...	$2.00	Nov. 1.	Pittsburg, Pa.
Adventure, ...	1.00	"	"
Isle Royale, ...	1.00	Nov. 5	Washington, D. C.
Toltec, ...	1.00	Nov. 15.	Boston.

North Western has fallen off from sales at 19 to 16 asked, and is very heavy, transactions in this market being generally limited. Adventure is seldom offered, the last sales were made at 4, but that price could not be obtained now. Isle Royale declined from 16½ to 14¾, the stock being pressed upon the market for sale, but has since rallied, and is now in demand at 15 bid. Toltec, which has heretofore been one of the firmest stocks on the list, finally yielded under the general pressure, and declined to 9½. This was only for one day, however, and now the shares are firm at 10½. This stock is a favorite with operators, both large and small, and it will be likely to advance considerably within a few months.

Ripley is in demand at 4½, and the accounts from the mine are favorable. At a meeting of the stockholders, Sept. 26th, the purchase of land, noticed in our last, was ratified, and to pay the cost of it ($35,000) an issue of 7000 shares of the reserved stock was authorized, to be disposed of to the stockholders of record on the 10th day of October (in proportion to their respective shares), for the price and sum of FIVE DOLLARS per share, to be paid for at the Treasurer's Office on or before Friday, the 20th day of October; and all stock not taken on that day by persons entitled thereto, will be disposed of by the directors at a price not less than $5 per share.

Fulton has been in active demand within a few weeks, and sold at 2¼ to 2⅝ until very lately, when the price declined to 1⅞ bid. The sales have been very large, amounting to nearly 14,000 shares in a month's time. There is an increasing demand now for the stock, and sales are making at 2¼. Forest fell off to 4½, but has since improved, and now sells at 12, with the $5 per share assessment paid. Glen, a company set off from the Forest last spring, is in better demand, 2½ being offered for the shares. Winthrop is firm at 2¼ bid, and there is a very large demand for the stock, "buyer's option," three or four months. Since our last, this company has opened a very fine vein, said to be a part of the Copper Falls, or "Hill Vein," so called. Should this prove to be of equal richness, as anticipated, the prospects of the mine are placed above doubt.

Minnesota sold at 170 a few days since, but it is reported that the company have declared a dividend of $43 per share, which will have a tendency to enhance the market value of the shares. Pittsburg ("Cliff Mine") is in good demand at about $150 per share, and very little stock offered at any price. This company has paid $15 per share in dividends within the present year, and for a year to come, will probably do much better. The Minnesota and Pittsburg are the only ones of the Lake Superior mines that have as yet paid a dividend; but there are several other companies which bid fair to take rank with them before the expiration of another year.

Phœnix is improving, and 7½ was bid to-day. Favorable accounts have lately been received from the mine, and the shares are scarce. Star is in fair demand at 4½. Shawmut, dull at 1½ bid. Native, very heavy at about 3½.

The market stands well for a general improvement, with the activity which usually prevails at this season of the year, but at present we lack the confidence of operators in the prospect for the future. The restoration of confidence in financial matters, would have a material influence in strengthening the market for *mining shares*, and cause considerable advance in their market value. As it is, however, this class of stocks has maintained its quotations much better than any other, and they are generally in favor with the public.

BOSTON MINING SHARE LIST.

Fluctuations for September, 1858, *in thirty-one different Mining Stocks, sold at the Boston Stock and Exchange Board, showing their highest and lowest points, and the date, with the market value at the close of the month, gain or loss for the month, and number of Shares sold in each.*

MINING STOCKS, BOSTON.	SHARES.	PAID IN, SEP. 30.	HIGHEST SALES.	DAY MO.	LOWEST SALES.	DAY MO.	VALUE, SEP. 30.	FROM AUG. 31. Gain.	FROM AUG. 31. Loss.	SHARES SOLD.
Adventure, Copper,	10,000	$10,00	4	19	3¼	7	4	0	0	250
Algomah,	20,000	1,87½	5	5	4	30	4	—	¼	1,195
Bay State,	20,000	,50	—	—	—	—	1¼	—	¼	No sale.
Bohemian,	10,000	—	—	—	—	—	3¼	—	¼	No sale.
Boston,	20,000	†2,00	8	5	3¼	17	3½	0	0	209
Copper Falls,	10,000	13,00	60½	26	52	18	60	3	—	457
Dana,	20,000	1,12½	2	5	1¼	24	1¼	—	¼	716
Forest,	10,000	10,00	7½	6	6½	15	6½	—	½	1,688
Fulton,	100,000	†2,00	2½	23	2	18	2½	¼	—	12,864
Glen,	10,000	†2,00	—	—	—	—	2½	0	0	No sale.
Isle Royale,	12,000	5,00	19	4	16	28	16	—	3	105
Malone, *Sandstone*,	40,000	†3,00	1½	1	1	16	1	—	¼	5,505
Manassas, *Mining*,	100,000	†2,00	—	—	—	—	2	—	¼	No sale.
Manitou, *Copper*,	20,000	1,25	—	—	—	—	1¼	—	¼	No sale.
Minnesota,	8,000	22,00	—	—	—	—	175	—	15	No sale.
National,	10,000	2,00	—	—	—	—	20	0	0	No sale.
Native,	10,000	3,25	3	3	3	3	3	0	0	50
North American,	10,000	17,00	71	22	70½	29	70	—	2	23
Norwich,	20,000	3,50	10½	26	10½	26	11	0	0	100
North Western,	9,000	10,00	19	3	18½	22	19	—	1	196
Phœnix,	10,000	5 00	9	6	6	30	8	—	1½	330
Pittsburg (*Cliff*),	6,000	18,50	160	14	149	26	153	—	8	54
Ridge,	10,000	6,50	—	—	—	—	4½	0	0	No sale.
Ripley,	40,000	†2,00	4½	23	4¼	2	4½	¼	—	4,075
Shawmut,	20,000	,50	2	29	1½	12	2	0	0	425
Star,	20,000	,50	5½	5	4½	6	5	1	—	922
Summit,	40,000	†5,00	—	—	—	—	5	0	0	No sale.
Toltec,	20,000	8,00	13	24	12½	29	12½	—	½	3065
Winthrop,	20,000	,75	2½	23	1½	16	2	½	—	100
Webster,	40,000	†2,00	2½	29	2½	16	2½	0	0	1,800
W. Castleton, *Slate*,	50,000	†6,00	—	—	—	—	3½	—	1	No sale.

† These are fully paid stock.

JOURNAL OF GOLD MINING OPERATIONS.

CALIFORNIA GOLD FIELDS.

There is no lack of spirit and hard labor among the miners of California, as the large shipments of gold from that State plainly indicate. Still it must be confessed that mining operations are far from being settled into a regular and systematic business. Many obstacles exist to retard such a result; perhaps the chief one is the indefinite tenure by which mining property is held.

TITLES TO MINES.

The decision of the Supreme Court of the State, published in the October number of this Magazine, which confers upon the State the ownership of all the mineral veins within its limits, is viewed by many of the miners with fear rather than favor. This arises from the wild and reckless course of former legislation, upon the subject, and the possibility that their rich inheritance might be sold or leased from beneath them in case that the legislature had the disposal of the mineral lands.

One of the principal papers published in the heart of the northern mining region, thus closes an article on the subject of the mines and the next legislature:—

We regret that the hope of amelioration for the mining population is thus indefinitely postponed. We had hoped that something would be done to give increased security to mining titles, to prevent rules and regulations made this month being over-ridden by the new comers of next; to afford facilities for permanent locations and comfortable homes; to create and maintain places of rational amusement or instruction, so that the gaming-table and drinking saloon would lose their attractions—in short, that an effort would be made to encourage the settlement of peaceable, industrious, and enterprising communities, whose homes would be here, and whose efforts would be directed as well to the advancement of the State as their own prosperity.

MINING OPERATIONS.

The mining interest continues quite prosperous, and under the operation of improved machinery and the application of science must progress. The most profitable branch now pursued is the working of auriferous earth obtained by sinking shafts and "drifting." The result of mining in quartz veins is thus estimated in the *Alta California*:—

The working of quartz, taken altogether, cannot yet be considered successful. Isolated instances of success must not be taken as a criterion of the business generally. No machinery has been constructed adequate to the grinding of the rock, and separation of the gold, and until vast improvements are effected in this respect, quartz mining will continue to be an extremely hazardous business, whatever the richness of the veins. This branch of mining has been greatly injured by speculative Stock Companies, which have necessarily in many instances proved disastrous to those investing in them. These bubble concerns deter capitalists from venturiug in any enterprise for grinding quartz, even where the judicious use of money in building machinery of the proper kind would be certain to produce a rich return.

Fluming enterprises are, at present, the most extensive and profitable, and

the completion of a single canal—the Mokelumne—caused an immediate increase in the yield of gold dust. On this method of operations we have the following:—

Now that the works of the Canal Company have been so far completed as to make the waters of the Mokelumne circulate around our hills, the hopes and wishes of our anxious miners are being fully realized. Numbers who came here from other camps and commenced throwing up dirt, are now reaping a rich reward for their prudence and foresight. The claims on our side hills are turning out very rich indeed, and in the gulches and ravines in the vicinity are satisfying the utmost wishes of the holders. It is a truly cheering sight, to walk around in the evening, when the sluices and toms are being washed out. and see the glittering ore in gleaming piles collected from the teeming earth. In each pan may be seen two, three, or five ounces; and although large numbers are at work, we hear of none going empty away. Some, too, come in for extras, and accordingly we hear of one claim producing a six ounce lump, $25 in coarse gold, and about four ounces in fine dust—very good wages for one day.

At Volcano there is a large population engaged in mining, with very fair success. The important work of draining the flat is progressing favorably. When completed, it will be the means of rendering available a large tract of the richest mining ground, besides greatly facilitating general operations.

At Sonora Flat, an extensive gold field has been discovered during the week, where it was supposed the color could not be found. It yields from 50 to 60 and 75 cents to the pan, and the wash dirt is fifteen feet deep. In consequence there is great enthusiasm here about mining, and claims are held very firmly—without a pick having been struck, we know of one for which $500 have been refused. Buildings are rapidly increasing, and every thing indicates a prosperous camp.

The operations on the river this year are very extensive, but little interest is taken in it by the miners here, in consequence of the abundant supply of water for those claims which heretofore have been entirely deserted at this season. River mining involves great expense and immense labor, and those only can engage in it who possess considerable means. From Clay's Bar to the Forks, about forty or fifty miles, every point is occupied, and in a walk of about eight miles along the bank, a friend of ours counted fifteen companies at work fluming. It is expected that in a week or two some may be enabled to commence work in the bed of the river. The high water has very much impeded operations this season.

Again, at Coloma the following operations may be seen:—

At Coloma may be seen several flumes of great length, supplying water to a large extent of country on both sides of the South Fork River, by means of which large quantities of the precious metal have been, and still continue to be, taken out, which otherwise could not have been obtained at all. In this way the miners have been enabled to work the entire flat around the old saw mill, where the first piece of gold was discovered in 1848.

A great many dams and flumes have been constructed this season on the South Fork, some of them at an expense of probably twenty thousand dollars, or more.

In some instances, a channel or race, of sufficient capacity to receive the entire stream, is blasted for a considerable distance, out of the solid rock; and where that is not the case, a flume is constructed, the materials for which it is any thing but an easy or inexpensive matter to convey to the spot required.

Usually, each river claim requires the construction of two dams across the stream before it can be worked; one at the upper end, to turn the water into the flume, and another at the lower end, to prevent the back water from the next claim below from continuing to interfere with the process of exhausting the space required to be dried.

Powerful pumps, put in motion by large wheels driven by the current in the flume, are next set at work, and thus the patient miner is at last enabled to get into the bottom of the river bed, and ascertain whether his industry and perseverance will be rewarded with an adequate return or not.

A person unacquainted with the design of the dams, wheels, pumps, &c., seen erected along the rivers, would naturally suppose they were intended for some permanent mechanical purpose, instead of, as is sometimes the case, only for a temporary service of a few short weeks.

The value of stock in these Fluming Companies, may be estimated by the following items:—

We are informed, says the *Sacramento Union*, that the Tuolumne Water Company have just declared a monthly dividend of *eight per cent.* on their capital stock ($275,000). This is one of the most flourishing and profitable of the many mining companies now in operation in this State.

The "Jackson and Sutter Water Company's" project, is recommended by the *Calaveras Chronicle* to the attention of capitalists. The water is proposed to be taken from the North Fork of the Mokelumne river, at the mill of the North Fork Canal Company. From this point, at ten miles' distance, the line strikes Rich Diggings, and from thence on they have the control of the immense gold field, embracing Volcano, Clinton, Jackson, Amador, Sutter, Drytown—in fact, all the diggings in a section of country twenty-five miles in extent. This section of country is one where it seems as if gold had been sown broadcast over the whole surface, and only wants the aid of water, which this canal is destined to supply, to be washed out. The Company have also the control of the best timber in the world, an acre of which in the San Francisco market would be a fortune.

One of the tunnels pushed under the city of Sonora, is reported to yield from fourteen to twenty ounces per day.

MINING REGION OF SONORA, MEXICO.

The most interesting portion of the mining country is that known as the Arisona region. It extends indefinitely from a southern limit, at twenty to thirty leagues north of Hermosillo, and with a mean distance of forty leagues from the sea coast. This country is occupied by the Apaches, who repel all definite explorations. There had, however, been some recent discoveries of almost fabulously rich mines of gold and silver within these boundaries. Our informant had seen specimens of the silver ore which contained 75 per cent. of the metal. A company of natives had attempted to penetrate to these mines, but had been completely repelled by the Apaches. The attempt was to be renewed by a compauy of five hundred, with a subscribed capital of $20,000. At present these mines are not touched, save when some venturesome native collects, after the rainy season, a few *chispas* or particles on the surface. Among all the natives there exist the wildest traditions of the wealth of these wonderful mines; and it is common to hear them speak of finding lumps of gold, in olden time, as large as the double fist.

A little below 31° north latitude, on the coast, we find the mouth of the Alter River. This river and its neigborhoods were, to some extent, surveyed by Mr. Spencer. On the coast, about three leagues south of the Alter River, Mr. Spencer discovered a *bight* in the land, affording ample security and anchorage to vessels. He was informed by the Alter Indians that about 10 leagues south, nearly opposite to the head of Tiburon or Shark Island, there was an excellent harbor. Along here the back country is an arid desert, but a trail of only three leagues conducts from the higher point of landing to the mouth of the Alter. This river flows west by south. It is not navigable. A sand-bar is formed across its mouth, and the stream during the dry season is occasionally lost in the sand. The villagers along the bank get their water, during the drought, by digging wells into the sand. The Alter Indians are

found on the lower part of the river, and are represented to be much more pacific than the Apache tribe. A good road leads along the bank of the stream, and is constantly relieved by villages and settlements. Further on the traveller will find these villages the mere relics of the desolation of the ruthless Apaches, until he finally arrives at the town of Alter, about thirty leagues from the mouth of the river of the same name, and within ten leagues of the indefinite boundary of the Arisona mines. There is said to be no necessity for the American mining immigration anticipating any opposition except from the more interior of the Apache Indians.

The climate of Sonora is most remarkably healthy. The wet season is included in August and September, when the rain is said to pour down in heavy and incessant torrents, completely surpassing the winter rains of California. In a limited portion of the State, to the northeast, showers are said to fall occasionally during the entire year. The soil is generally barren along the coast, but in the interior will be found the most excellent lands for pasturage, occupied by all kinds of stock. The lands are exceedingly rich, but need investigation. The usual cereals, and a variety of vegetables, are raised with much success, but only to a limited extent.

AUSTRALIAN GOLD FIELDS.

The latest reports from the Australian fields, not only represent a rich yield of gold, but a far more flattering prospect in relation to the civil and social condition of the inhabitants.

The Colonists were rejoicing in the liberty allowed them to frame new constitutions for their government. The various Colonial Legislatures had the subject under consideration, and before the lapse of a month the new constitutions were expected to be ready. Transportation to Van Dieman's Land has at length been stopped by the British Government, and the famous Australian League, which has for years been agitating against the odious system of emptying English prisons into the Colonies, having attained its object, is about to disband. The New South Wales Legislature had under discussion an act to remove some of the most obnoxious provisions in the Gold Bill, imposing a heavy license upon the miners.

The results which had followed the adoption of the Gold Act, are described as having been exceedingly disastrous in New South Wales:—

The exceedingly unwise law passed in the last session of Council, has proved much more generally disastrous to the gold-mining enterprise than is 'dreamt of in the philosophy' of our legislators. Hundreds upon hundreds of valuable and industrious persons have been forced away from our mines, who, under happier auspices, would have stayed amongst us; and, after assisting in the development of our mineral treasures, would have turned their energies and skill to other pursuits of more permanent interest. This unfortunate state of things, it is very much to be feared, will not be repaired by the Amendment measure proposed by the Government. So much mischief has now been done, that an extraordinary measure of relief is required. The license fee must be reduced to 10s. per month, or at most, not more than half the present amount, if population is to be attracted to our almost ruined gold fields."

And again:—

From the recent discussion in the Legislative Council relative to the repeal of the Gold Act, some of our members show themselves so bigoted, they will not see the advantages that would accrue to themselves and country by more expanded views; looking on the diggers, not as men giving the vast impulse to our present social and commercial progress, but rather as clogs to our prosperity, and thinking they are now down, determined, if possible, to keep them so. Fortunately, the Auditor General was at his post, to tell of the increased revenue, and the Honorable, the Colonial Secretary, with

his usual discrimination, pointed out to what class the country was indebted for that increase, which cannot be more forcibly expressed than in the following extract from his speech, as reported: 'He (the Colonial Secretary) thought the gold digger was entitled to the same treatment as any other man, and when it was considered how largely the revenue of the colony had been increased by the result of the gold diggers' labors—how property of every sort had risen in value —how great was the proportion which the gold digger contributed to the public revenue—he could but feel that he was entitled to the most favorable considertion, instead of being branded and proscribed, because his occupation was not to the taste of certain honorable members.'"

At the latest date from Sidney we have the following report:—

But very little gold now reaches us from the sister colony, in consequence of the price in Melbourne approximating to the rates in this market; and the flooded state of the country has been such that none of the escorts on our side have arrived.

Letters received from the Turon and other diggings, are all anxiety for the report of the Select Committee on the Gold Fields Management Bill. Upon that depends our future prospects: if mild laws are enacted, population will flow in. The gullies and places distant from the river will be worked, as it will then enable the digger to cart his stuff from a distance, and employ hands, which at present cannot be done, with the heavy impost now levied. Our mines up to the present have only been scratched; there is no fear, if a liberal policy is pursued, but rich and valuable localities will be found ere the summer has passed. The last enactment of our Legislature drove away 5000 of our best miners; we are now all anxiety to know what will be done to bring thousands back.

Intelligence from the Ovens is still of great encouragement, and a large amount of gold is being obtained, and will increase as the weather becomes fine.

Last advices from Port Phillip, by the Waratah, state that more gold than usual arrived during the week. The McIver gold is one-eighth of a grain better than Balaarat, which is considered the best.

COMPARATIVE YIELD OF THE AUSTRALIAN AND CALIFORNIA GOLD FIELDS.

In the year 1852, the total exports from the Colony of Victoria, by customs returns, amounted to £7,451,549. Of this sum, £6,135,728 is set down as the value of gold exported; but as the quantity actually shipped was 1,974,975 ounces, it appears that it was estimated at little more than £3 per ounce—far below its value. At £4, the value of it in London, the amount ought to be £8,110,703, or about $40,000,000. In an elaborate address to the Chamber of Commerce in April last, Mr. Westgarth stated, that in addition to the above 1,974,975 ounces, 1,600,000 ounces had been traced to the neighboring Colonies, or otherwise exported without official record, and that on a careful estimate, the total produce of the gold fields of Victoria in 1852, was 4,545,780 ounces, which at $18 to the ounce, would amount to $81,824,040. This estimate was universally considered to be nearly correct. Exported, as per steamer and manifests, from California during the year 1852, $45,559,177. Allowance for sums taken away in the hands of passengers, and shipped without being manifested, $5,000,000. Total carried out of the State, $50,559,177. The total export from Victoria from the 1st of January to the 1st of June, 1853, five months, was £3,657,967; from Sydney, up to June 25th, nearly six months, £4,727,649. In this last sum is included a considerable portion of the gold shipped from Melbourne, but how much, it is impossible to say. Considering this as about equal to the export from Melbourne in June, the total export from Melbourne and Sydney, for the first half year of 1853, would be £8,403,616, or about $42,000,000. Exported from California during the same time, $28,991,552. In hands of passengers, (estimated,) $2,000,000. Total, $30,991,552. From this it would appear Australia has yielded a larger amount of gold than California:

but it should be borne in mind that the number of miners in Australia is fully double the number actually engaged in digging in California; so that the individual average is at least in favor of the latter.

GOLD IN THE AMAZON.

We make room for the following *jeu d'esprit*,—for in no other sense can we understand it,—which is worthy to grace the pages of the Arabian Nights. It serves as an illustration of the extravagant and contradictory tales which may find currency when scientific principles are overlooked or neglected. It first appeared in the Spanish portion of the Panama Star, which had the modesty to decline vouching for the correctness of the statements:—

The letter is dated at Chachapoyas, Aug. 17, 1853, and reads as follows:—

Don Mariano Aguilar left this on the 10th inst., to commence the opening of the road to the River Amazon, with the $2,059 granted by the State for that purpose.

The important day which shall enrich the North is near, and within two months we shall be on the shores of the River Santiago de Borja, travelling over its golden sands, and in the midst of the rich and fertile plains of the majestic Amazon.

A person travelling by the River Ucayali, for Parura, has discovered a short distance from the shore of said river, a chalk hill, which at first appeared to him to be of little importance, but as a pastime he took several pieces for examination, when, what was his surprise at finding a gold ring on his finger apparently converted into silver.

It at once struck him that this earth must contain quicksilver; and he continued to inspect further into the hill, until his surprise was further increased by coming at length to a lake of fine quicksilver, of some twenty yards in circumference, and on more minute examination, he found in various parts of the hill, drops of quicksilver filtering through a kind of yellow earth partly concealed among the herbs.

Within five days Dr. Renia will be *en route* with a sufficient force to commence the work at the rich copper mine of Chachahuala. It is expected in this province that these mines will, within two months, prove a second Copiapo, in respect to these same copper veins, which contain an alloy of 1,800 marks.

Fifty years ago a man excavated the vein to the depth of fourteen yards, and the result was that the layer of copper disappeared, changing to pure silver. From this silver the ornaments of the church of this city, still in existence, were made. The discoverer worked alone, and after his death no one was able to discover the mouth of the mine. In this way it is expected that Dr. Rania will, without doubt, having worked through the copper layer, meet with a compact bed of silver.

In conclusion, it is said that within sixty days the gold washings of Santiago de Borja will be discovered, and the hill of Chachahuala will be reduced to solid silver, and afterwards the quicksilver mines of Ucayali.

The following may also be added to the preceding:—

La Libertad, a paper published in Trujillo, says, that every day increases the desire there to have the road opened from Bongvra to the Amazon, owing to the extraordinary reports which have reached Santiago de Borja, where the road terminates, regarding the discovery of gold in the beds of the Amazon and its branches.

The reports previously received here of one man being able to take out *twenty-five pounds* daily are confirmed, and it is added positively, that these rich washings extend for forty leagues.

Commandante Najar reported, some time since, that in a handful of sand more than half would prove gold. From Chachapoyas to the margin of the gold district is thirty-six leagues, and the journey can be made on foot in four days.

THE DORN MINE OF SOUTH CAROLINA.

This mine is known for its rich yield of gold since operations were commenced upon it. A letter from Mr. J. J. Field, the cashier of the proprietor, contains some particulars of interest respecting the vein and the workings upon it:—

The Dorn Mine is situated in the lower end of Abbeville District, South Carolina. It was discovered on the highest hill in the neighborhood, six miles east of the Savannah River. The course the vein runs is west 12 degrees south. It was discovered one year ago. At the surface its width is not more than eighteen inches. It continues to widen gradually in going down, and at ten feet below water level, in cutting across, its width is fourteen feet. Do not understand me to say that all the ore in this vein is of the richest quality. The vein seems to be composed of streaks or stripes of rich ore. Beginning on the south side of the vein, we find a streak about six or eight inches wide, that gives ore that will average $50 per bushel, though you could select ore from this streak that would make $2000 per bushel. Then comes in a streak of poor ore about eighteen inches wide, that will average $5 per bushel. Then comes another one of the rich streak, and so on for the width of fourteen feet. The proprietor has run a tunnel lengthwise on the vein in a west direction forty feet, and finds the ore fully as rich at the end of the tunnel as at any other part; and at the distance of three hundred feet on the east of the vein from the shaft they are now working, he has found the vein, that has every appearance to be as good at that point as at the place he has been working for the last twelve months. The whole distance gone down on this vein is forty feet from the surface, and ten feet below water-level.

The amount of gold made at this mine one year from the discovery of its being so extraordinary rich, is $202,216 09.

GOLD MINES OF NORTH CAROLINA.

In the October number of this Magazine, Vol. I. No. 4, will be found many important facts relating to the Reid and Gold Hill Mines. We now add some further particulars of interest from an intelligent and reliable source:—

The three great gold mines of North Carolina—those which have unquestionably yielded more gold than any others—are Gold Hill in the county of Rowan, the Capps Mine in Mecklenburg co., near Charlotte, and the Reid Mine, located in Cabarras county, some fourteen miles from Concord, the county seat of that county. The Gold Hill has been operated with more perseverance, skill, and success than any others in the State; or, perhaps in the South. The Capps Mine, however, some fifteen or twenty years since, was operated by some Northern capitalists, and has yielded nearly as much gold as Gold Hill from a space much more circumscribed, and at a depth much less. This mine is situated in the granite formation, and has been worked to the depth of 160 feet and 100 feet, without abatement of its fertility.

The Reid Mine has become famous on account of the discovery of the immense mass of 28 lbs. avoirdupois, about twenty years since. The discovery was made by a young negro boy, still living in the vicinity, who accidentally found the unequalled "lump," and conveyed it to the house of Mr. Reid, the proprietor of the estate, without any appreciation of the value of the treasure which fortune had thrown in his way. For several months it was permitted to lie on the floor as a curious "rock," (for there was attached to it a few pebbles of quartz) and it was used as a weight to keep open the door of the house in windy weather. Some persons living in the vicinity of Mr. Reid—without, however, at all suspecting that the heavy and misshapen mass was gold—advised him to throw it into his wagon, with other articles making a load, and take it to Fayetteville, and probably he might get something for it, or probably he might there learn what it was. This was accordingly done, and Mr. Reid's merchant in Fayetteville told him it might certainly prove to be a metal of some sort, and that it ought to be taken to a silversmith, who, upon exam-

ination of it, to the surprise of Mr. Reid, offered him twenty-five dollars for it. He readily accepted, and returned with exultation to his neighbors, at the success of his adventure. It was not until after some time, and when other discoveries had demonstrated the existence of the precious metal, that Mr. Reid became aware of the extent of the imposition to which he had been subjected. More large masses of gold have been found in this locality than any other in America, unless California be an exception. In Wheeler's history of North Carolina, under the title of Cabarras, will be found a letter written by George Barnheart—a son-in-law of Mr. Reid—giving a history of the mine, which is entitled to the fullest credit. Lumps of gold, according to Mr. Barnheart, have been found in various parts of the location, weighing severally, 9, 7, 3, 2, 1½. 16, 9½, 13¾, 4½, 1, and 8 lbs.

VIRGINIA GOLD MINES.

Of the *paying* mines of Virginia may be mentioned the Marshall Mine in Spottsylvania county, on the Rappahannock River, twelve miles from Fredericksburg. From this mine some $300,000 have been extracted. When last visited by the writer, twenty hands were employed. The yield was from $150 to $200 per day. The workings extend to a depth of a hundred feet. In Fluvanna county, Commodore Stockton has long been working mines. The yield of gold has been considerable, though it is understood that large sums of money have been spent upon machinery, which was finally rejected. Very recently we learn that the mines known as the Garnett and Moseley mines in Buckingham county, which have passed through several hands, have finally been purchased by an English Company, who are working them. This tract contains 1300 acres, upon which are several veins. The main vein, at a depth of one hundred and ten feet, is fifteen feet wide, and yields about $20 to the ton. Besides a staff of engineers, they employ seventy negroes. The daily yield we have not learned. The London and Virginia Gold and Copper Mining Company have purchased a property joining the above, and known as the Eldridge Mine, for $150,000.

YIELD OF SOUTH AMERICAN MINES.

The following is a report to the Mariquito and New Grenada Company, of the operations of their mines in the month of April. Although not of the most recent date, we give it a place as showing a month's operations:—

MARMATO MINES FOR THE MONTH OF APRIL.

Ores raised. 1475 tons; rough ores, remains, stull stuff, and remains of remains stamped, 1588 tons; average number of stamps-heads at work, 84; daily average per stamps-head, 12¾ cwts.; fine gold per ton of ore stamped, 7 dwts. 15 grs.

	Fine gold.	Fine silver.
Obtained from the stamping mills....	619 ozs. 18 dwts.	368 ozs. 1 dwt.
Obtained on purchase	236 ozs. 1 dwt.	131 ozs. 10 dwts.
Total	855 ozs. 19 dwts.	494 ozs. 11 dwts.

Cost .... $16,634 | Returns $21,671

Remittance received by the *Orinoco* packet:—Fine gold, 855 ozs. 19 dwts.; fine silver, 494 ozs. 11 dwts.

SANTA ANA MINES FOR THE MONTH OF APRIL.

Ores raised, 363 tons; mine produce for amalgamation, 48½ tons; rough ores stamped, 367 tons; average number of stamps-heads at work, 23.

Cost .... $6887 | Returns $7733

Also, 104 packages of sulphate of lead, cupel stuff, &c., containing gold and silver, were received by the Company at the same time with this report, valued 1433*l*.

PRODUCTION OF GOLD BY ARTIFICIAL MEANS.

M. Theodore Tiffereau, a Frenchman, says that he has discovered the means of making gold. In a paper laid before the Academy of Sciences, entitled "The Metals are not Simple, but Compound Bodies," he has put forth his views, and asserts that he has actually produced gold by artificial means. He proceeds upon a principle, admitted by all chemists, "that the properties of bodies are the result of their molecular constitution," and he adduces numerous examples in chemistry—in which bodies assume different properties according as they have crystallized in one form or another, although their composition remains the same. All that he had to seek was a substance which, by its catalytic forces, would act upon the body which it was desired to transmute, and then to place this last, under certain conditions, in contact with it to effect the change. He believes that there are but very few simple substances in nature, and considers that the forty metals, now assumed to be such, are in reality combinations, probably of one radical with some unknown body, hitherto not studied, but which of itself alone modifies the properties of this radical, and thus presents us apparently with forty bodies, while in reality there is but one. If any one have discovered this body, which has hitherto escaped the researches of philosophers, and can cause it to act on any given metal, is there any thing surprising that he can change the nature of the metal, by giving it, with a different molecular constitution, the properties of that metal in which this constitution naturally exists? This he asserts he has done.

JOURNAL OF COPPER MINING OPERATIONS.

IMPROVEMENTS IN OBTAINING COPPER AND ZINC FROM THEIR ORES.—PATENTED BY JOHN BETHEL, WESTMINSTER, LONDON.

The following are the processes of the patentee. Having had the ore reduced to fine powder, he mixes together several portions of it with certain quantities of any sulphuretted ore. This mixture he then slowly roasts in a common reverberatory furnace, a free current of air being allowed to pass over it, the same being hindered from coming in contact with the ore itself.

During the roasting, which will last for about two or three hours, the ore is frequently stirred about, the heat not being allowed to become great enough to sublime the sulphur in the ores. After this, about twenty per cent. of small coal, and a little sulphuretted ore, are to be added, and the whole mixed well together, and repeatedly roasted in the open air. The mixture is then drawn into a wood or stone cistern, and has about four parts of boiling sea-water stirred with it. This water is to dissolve the sulphate of copper that has been formed by the roasting. The solution is then removed to another cistern, and mixed with as much slaked lime as will be sufficient to combine with the acids, and the copper will be precipitated as an oxide, from which the metal can be obtained by the ordinary process.

Claim.—The obtaining of copper and zinc from their ores, as above described.

LAKE SUPERIOR MINING OPERATIONS.

The Report of the New-York and Michigan Mining Company, issued on the first ult., states that, although the mine has now been worked over two years, the assessment, up to August, was only $2.75, including cost of land and all expenses. The following is a concise statement by the Treasurer, C. M. Guild, Esq., of the finances of the Company:—

To Cash on hand, as per last statement, March 3d, 1853 . .		$1,713 86
" Cash received from instalments from March 3 to Sept. 21, 1853,		2,667 75
		$4,381 61
Cr.		
By Labor and Expenses at the mine, from March 3d to Sept. 21, 1853	$4,204 54	
Office Expenses, like term	143 20	$4,347 74
	Balance on hand	$33 87

New-York, September 21, 1853.

Operations have not this summer been prosecuted very vigorously upon this mine, in consequence of a proposition to sell in Europe. This has now been given up, an assessment of 50 cents per share was laid Sept. 10th, and the Directors intend to prosecute their operations with vigor. We extract from the the Report the following statements of the Superintendent and Managing Agent, Capt. John Hoar. The vein spoken of is in the western part of section 12:—

In his letter to the Secretary, Jan. 29, 1853:

The vein for the last ten or twelve feet has been affected by a small cross course, but appears to improve again as the cross course leaves the shaft. The vein in the north end of the shaft is ten inches wide, well charged with copper.

Of the above vein Capt. Hoar thus writes, under date of Feb. 11, 1853:—

We have a good vein, a vein that will pay for stopeing out. In the shaft for the last twenty-five feet, the vein has been disturbed by a small cross course. . . . I have taken the masses down to the harbor; the three small masses together weighed 747 lbs.; I think the large one will weigh 1000 lbs. or over; there are no scales in Copper Harbor that will weigh it.

Again, in his letter of March 11, 1853, he states:—

Yesterday, in grubbing a piece of road for the horse to walk on, to hoist the stuff from the bottom, we discovered a vein from two to three feet wide; it is one hundred and fifty feet to the west of the vein we are now working on As soon as the snow is off the ground, I will prove it up. It is a strong-looking vein.

June 11, 1853.

A large vein has been opened in the Lac La Belle location, east of the vein we worked on last fall. The vein is on the east line of the quarter-section south of us, about 18 degrees west of north, which will carry it through the New-York and Michigan land to the north line. There is every evidence that we have a valuable property here: all that is wanted is capital to open the veins.

July 1, 1853.

I did intend to keep but four miners at work this month, but as the vein is improving so fast, I shall keep six miners in the drift. The vein is twenty inches wide, producing good stamp and barrel work.

August 23, 1853.

The vein is rich with copper, but very small. It is a very strong vein, and would certainly make good in the trap formation. It would be advisable to drive that drift a little further on the north quarter-section."

September 3, 1853.

The vein is improving very much in the last three or four feet. The vein is ten inches wide—rich stamp work.

STATEMENT OF THE TREASURER OF THE FOREST MINING COMPANY.

To the Stockholders:—

I am instructed by the directors to submit to you a statement showing the financial condition of the company, with an estimate of the probable expenses of the mine, to the first of July next.

Outstanding liabilities of this office on September 1, ...	$13,941 22
Estimated liabilities at the mine on September 1, ...	10,000 00
Estimated amount for supplies to be paid for by 1st December, . . .	7,000 00
Estimated monthly expenses for ten months, to July 1, 1854, at $3500 per month, ...	35,000 00
	$65,941 22

To cover the foregoing liabilities and estimated expenditures, there will be the amount to be received from the assessment now notified of $5 per share, ...	$50,000 00
In addition thereto, the quantity of copper to be shipped from the mine before the close of navigation, which, the Agent advises, is likely to be a considerable amount.	
Out of the sum set down for monthy expenses should be deducted, . the same being paid in supplies, charged in above statement as liability.	$10,000 00

The mine will be extensively opened the ensuing winter, and there will be on hand, July 1st, 1854, all the copper raised for seven or eight months; and as, by means of the stamp-mill (now in successful operation), the fine copper, as well as the masses and barrel work, can be brought to market, a very considerable sum may reasonably be expected to be realized from the product of the mine during that period.

Your obedient servant,
HORATIO BIGELOW,
Treasurer of the Forest Mining Co.

Boston, September 6, 1853.

P. S.—Since the above went to press, advices from the mine, satisfactory to the directors, have been received, and stockholders are invited to call at the office and see them.

SHAWMUT MINING COMPANY.

The office of this company is located in Boston. Their mining operations are carried on in the county of Ontonagon, Michigan. The capital is $500,000; number of shares, 20,000. On each share $1.50 has been paid. The names of the Directors for the year ending in June, 1854, are as follows:—

B. L. Allen, Robert Farley, James C. Dunn, and John A. B. Cutter, of Boston; Edward Crehore, of Milton; Charles H. Close, of New-York; James Carson, of Michigan.

From the Report of Mr. A. Rudolph to the Board we gather the following particulars:—

The Caledonia and Eagle locations each comprise one quarter-section of land; the Caledonia the N. E. quarter, and the Eagle the S. E. quarter of section 10, township 52, N. range 36 W., which is about ten miles from the mouth of Misery River.

Caledonia Location.—On the left bank of the north branch, which forms the falls called the "Caledonia Falls," and just above a cascade, about thirty feet high, a fine copper-bearing epidote vein is exposed. It crosses the creek in an almost due E. and W. course, and can be traced to the left bank of the creek on the foot of the cascade; it is perpendicular, has a regular, well-developed foot wall, composed of amygdaloid trap, and lined with a seam of laumonite, one-half an inch thick; the head wall cannot well be traced, owing to the decomposed state of the rock; the vein appears about three feet wide, and

is formed of hard compact epidote, amygdaloid epidote (its vesicles filled with white quartz), and seams of chloride, quartz, and a little limespar, all richly charged with bright grains of native copper; in the softer portions of the vein the native copper has changed into carbonate, with which those parts are deeply stained. A seam of laumonite, three-fourths of an inch thick, runs through the vein about four inches from, and more or less parallel with, the foot wall. In the immediate vicinity of this vein, a little further down the creek, several feeders of white quartz, containing native copper and masses of epidote, also charged with grains of the same metal, can be noticed, doubtless connected with the vein, the description of which I have just now given. The entire appearance of this vein is very promising, and will justify a very careful exploration.

Eagle Location.—Four different veins have been opened on this quarter-section, three of them only on one point on the surface, the fourth to some depth by a shaft. One opening on the Eagle is a shaft, ninety-six feet three inches deep, sunk on the same vein, which has been opened on the Caledonian by a shaft, to the depth of twenty-three feet only. This vein is exposed along the S side of a greenstone bluff, extending for several miles through the neighboring sections, and along the entire length of which it can be traced; the greenstone, forming this bluff, is underlayed by trap rock, and the shaft proves the vein to cut through the greenstone into this underlaying trap, the richness and general appearance of the vein improving, as it enters the latter formation, in accordance with our experience in that respect in the Lake Superior mining district. The shaft, with which this vein has been opened on the Eagle, stands near the W. end of the bluff, and is, as before stated, ninety-six feet deep on the dips of the vein; this vein is between 65° and 75° N., but the angle increases in the lower part of the shaft; the course of the vein is here 45° E. of N. Down the entire depth of the shaft the vein has well defined, smooth, regular walls; the width of the vein is somewhat larger near the mouth of the shaft (about six feet) than in the lower part of it, in which it is four feet; this difference arises from several feeders branching off the main vein, near the surface; in the lower part of the shaft the width of the vein continues very regular. I did not succeed in finding the junction of the greenstone and trap rock, which, if there is such, must be about sixty-seven feet below the mouth of the shaft; but by the appearance of several specimens of wall rock I obtained from the sides of it, it seems to me, that the change from the greenstone into trap rock is a gradual one.

NORWICH MINE.

This mine is situated on the north fork of the west branch of the Ontonagon River, Lake Superior, Michigan, on sections 11 and 12, Township 49 north, Range 41 west, containing one half section, or 320 acres. The title is derived originally from the government of the United States. That portion of the tract on which the veins have been discovered, is situated on a trap rock bluff, which runs nearly east and west, and presents a very uneven and precipitous face to the south. From the top of the bluff to the north, the descent is more gradual. The main vein crops out about two-thirds of the way up the face of the bluff, or from 200 to 250 feet from its base, and runs nearly parallel with the course of the mountain range, dipping into the bluff to the north.

From the report of the company we learn that the Norwich Company was organized on the 17th of May, 1850. It was created as a "separate and distinct interest," and divided into twenty thousand equal shares, *all made assessable*, from the beginning; and they have been so assessed. The assessments were limited to five dollars a share, and to July 1st, 1853, had been assessed in all, three dollars a share. The accounts with this mine, like those with every separate interest connected with the American Mining Company, are kept entirely distinct from all others. There is no liability of the shareholders, except

that of a lien on their shares for all assessments; which lien, by the charter and by-laws, adheres to the shares under all transfers and changes and conveyances of stock, until removed by payment, or by sales of delinquencies.

The ground plan of this location embraces about three hundred and twenty (320) acres.

Another half section, or 320 acres of land, situated about two miles to the south, consisting of meadow and agricultural land, has been entered, and now belongs to the Norwich Mine, making 640 acres in all.

Shaft A is 80 feet from surface to level, and 10 feet below N. Shaft B is 270 feet to adit level. Shaft C is down 23 feet from surface, and 35 feet from adit. The McDonald shaft is down 29 feet. The adit level, or lower adit, to shaft B, is 526 feet, of which 84 feet remained to be driven, on the 2d July. The upper adit, to shaft B, is 172 feet. The adit, to shaft C, is 100 feet. The whole amount of excavation to July 1st is estimated at over seventy-one thousand (71,000) cubic feet. The vein at the end of the adit level, 270 feet from the surface, is rich in copper, and of increasing width.

The following is from the report of the engineer, who examined the mine in June last:

"In the ground, from shaft A, 40 feet east and 60 feet west, on *first level*, are masses of copper, weighing some 30 tons each, if they hold their thickness, and extend to the points where they have been found below. In this 100 feet of a continuous course of copper, the masses will vary from 1 lb. to 50 tons, rich barrel and stamp work. In the drift, under that point, directly under where shaft A would pass 61 feet deeper than it is now, are indications of this course of copper. At a point 40 feet west of where shaft A would pass, that level is a mass of copper projecting into the drift, which is a continuation of the course of copper in the level 60 feet above. There is a solid mass of pure copper, extending some five feet along the top of the drift, 1-2 (half) a foot wide, projecting into the top of the drift some two feet. From that point, west, to the end of the level, (20 fathom level,) the vein is two and a half feet thick, the lode being composed of the richest barrel and stamp work. At the extreme end, 75 feet from shaft A, (i. e. where it would pass that level,) it is equally as rich and still continues. Over it, and along here, no stoping has been done. The drift is still continuing."

Expenditures and Receipts to July 1, 1853.

Expenses to January 1, 1851,	$9,930 60	
Do. do. 1852,	11,970 71	
Do. do. 1853,	25,105 33	
Do. July 1, 1853,	18,371 86	
		$65,378 50
1st Assessment, payable 1st May, 1850, on 20,000 shares, 25c. per share,	$5,000	
2d Assessment, 1st October, 1850, on 20,000 shares, 30c. per share,	6,000	
3d Assessment, 10th July, 1851, on 20,000 shares, 50c. per share,	10,000	
4th Assessment, 1st December, 1851, on 20,000 shares, 50c. per share,	10,000	
5th Assessment, 24th August, 1852, on 20,000 shares, 50c. per share,	10,000	
6th Assessment, 10th February, 1853, on 20,000 shares, 50c. per share,	10,000	
h Assessment, 1st June, 1853, on 20,000 shares, 45c. per share,	9,000	
Ore sold in 1852,	453 61	
		$60,453 61
Balance against the mine, July 1, 1853,		$4,924 89

A further assessment of $10,000, or 50 cts. a share, has been laid, payable July 15th. Thirty-four (34) masses, weighing 16,160 lbs., and 27 barrels of copper, weighing with the masses, 45,325 lbs., were shipped from the mine in June. The supposed value is 22 to 24 cents per lb., as it is. Lake Superior ingot copper, of the same quality as this will be, after smelting, brings 29 cts. per lb. in market, and is estimated to be worth two cents per lb. more than English refined copper.

A steam engine of 40-horse power is nearly completed, and will leave for the mine on the 10th of August. It will be prepared to run 16 head of stamps, and will also drive a saw-mill attached. It is expected that 30 tons more of copper will be shipped before the close of navigation this season; and as there is already sufficient stamp work out to make 100 tons of copper, it is more than probable, that if the engine and stamps arrived safely, 300 tons of mass, barrel and stamp work, will be ready for shipment early next season.

MONTREAL MINING COMPANY.

The report of this company located on the Canadian shore of Lake Superior, contains some valuable facts. The President is Hugh Allan, Esq.

The general rise in the value of all descriptions of property, caused in part by the abundance of money, induced the directors, early last spring, to look into the subject of the other mining locations on the Great Lakes, to which this company had formerly acquired the right. It is doubtless known to many of the stockholders, that parties representing this company had selected eighteen locations, of ten square miles each, on the northern shore of Lake Superior, many of which were supposed to contain valuable deposits of native copper, and four locations on Lake Huron, which were favorably spoken of, in addition to the Bruce Mine. On each of these twenty-two locations, the sum of £150 had been paid to government as a deposit—making £3,300 in all.

The number of acres in a location of the size mentioned, is 6,240, which, at the government price of 4s per acre, is about £1,250 for each lot, leaving, therefore, £4,100 yet to pay, or £24,200, in all.

On inquiry, however, it was found that the whole of them had been forfeited several years before, in consequence of the conditions imposed by the government not having been complied with. As soon as this was ascertained. the directors prepared and submitted to the government a statement of the circumstances under which this took place, and they at length, in conjunction with other parties similarly situated, succeeded in obtaining an extension of time till the first of November next, at which date they will be called to say whether they will take and pay for all or any of those locations. or whether they will abandon them, and forfeit the money already paid on account.

Early in spring the directors effected an arrangement at reasonable rates with Messrs. H. Jones & Co. for the transportation of all their ores from the mines to Montreal, and for their goods upward. The freights, however, from hence to Swansea have been very high all the season, and it would be greatly to the advantage of this company, if by smelting the ore at the mine this heavy expense could be saved.

On a recent visit to New-York the President ascertained that nearly every article which enters into the economy of smelting could be delivered cheaper at the Bruce Mine than in that city, where smelting is successfully carried on. The chief difficulty would seem to be a flux suitable to the reduction of the refractory ores of the Bruce, but this is likely to be found in the rich ores of some of our Lake Superior locations, and if so, the directors are unable to see why smelting could not be as well managed and as favorable results obtained from it at the Bruce Mines as in New-York. There is reason to suppose that the experiment already tried at the mines was not under favorable circumstances, and it may be worthy of consideration whether another attempt on a small scale, and carefully carried on, might not be made.

The directors now proceed to lay before the stockholders an abstract of the liabilities and assets of the company at the present time.

DEBT DUE BY THE COMPANY.

To the Bank of Montreal,	£4,444 16 2
On Bills payable,	3,097 5 3
	£7,542 1 5

ASSETS.

200	tons ore sent to N. Y.,	£2,000	
100	do do do England,	1,000	
24	do Furnace Bottom, 30 per cent.	2,400	
40	do do 50	2,000	
450	do ore in store here,	5,400	
300	do do on board Sorell,	3,500	
300	do do yet to come,	3,750	
236	do do sold in N Y.,	2,536	
1650		22,586	
	Off 236 tons already paid,	2,536	£20,050 0 0
	Leaving the whole balance of		£12,507 18 7

The whole of the ores above-mentioned have been shipped from the mine except one lot of 300 tons, which will come down early in October; and of the remainder, the whole has arrived here except the cargo on board the Sorell, which is on its way down.

The values at which the different parcels are estimated, are the lowest which there is any reasonable prospect of their arriving at; but as on the contrary a large rise in the price of copper ore is expected, the result may be considerably better.

With this statement in view the directors have felt themselves warranted in declaring a dividend of five shillings per share on the 45,402 issued shares of the company, amounting to £11,351, which at their meeting on Monday last they accordingly did, and it will be immediately advertised as payable to the shareholders on and after the 15th of October.

In addition to the dividend thus declared, the stockholders will bear in mind that the following payments have been made during the past year from the profits of the mine only, and without any call on the shareholders:—

To Messrs. Rankin and Keating, for purchase of the mine,		£3051 16 3
Interest,	£1511 19 3	
Various parties for interest, and other liabilities incurred before the present directors assumed office,	£1128 7 1	
		£2640 6 4
Amounting to		£5681 19 8

This is equal to a further dividend of 2s. 6d. per share, which but for those payments would have been given to the stockholders.

There remains still one payment of about £3000 to make on the purchase of the mine, which, however, is not due till next year, and it is to be hoped that the payment for interest will henceforward be greatly diminished.

There will be a probable balance in hand after paying the dividend amounting to	£1150 0 0
And there are of goods in store at the mine, about	3000 0 0
Mining materials, about	3000 0 0
Making in all	£7150 0 0

Which is amply sufficient to carry on the mine till the close of the season, and pay any arrears of wages that may be due.

NORTH CAROLINA COPPER COMPANY.

A correspondent of the *Commercial Advertiser* of this city, writing from Weldon, N. C., thus describes his visit to the Fentress Mine of the North Carolina Copper Company:—

In Guilford I visited one mine containing well defined lodes, which have been regularly opened for working, and from which much valuable ore has already been raised and shipped to market, viz., the Fentress Mine, belonging to the North Carolina Copper Company. I went down one of the shafts to see for myself, and did see a vein of ore rich in quality and apparently increasing in size, from which I "mined" as pretty a specimen of cupreous ore as any proprietor would like to look at. An experienced and scientific miner, whom I met with elsewhere, not at all connected with the mine, and who had also been down into it and examined it, told me it was the richest mine that he had seen in the State or in Europe. The company had been laboring under some disadvantages lately, in consequence of delay in getting their steam engine in operation, which was being then put up, and was necessary to keep the main shaft free from water.

From this shaft—about one hundred feet deep—was taken while sinking it, the large quantities of rich ore, which so astonished every one, and proved it to be a mine of great value. An engine being necessary in drifting into the lode, the working of that shaft has been mainly suspended until that aid is obtained. Hence the quantity of ore that has been mined lately is much less than at an earlier period of working. A part of the force, however, has been employed in sinking a third shaft, about 300 feet from the first, where I was informed they had just struck the vein at about 60 feet deep. With this addition to the working room, when the engine begins to work, the force employed will be able no doubt to raise ore in such quantities as will fully satisfy shareholders, and make them care but little about the quotations of their stock in Wall-st. The ore is there in abundance, and rich, and the superintendent of the company, Mr. Wilder, appears quite competent to have it mined advantageously. Under his management no doubt the mines will be worked profitably.

POTOMAC COPPER COMPANY.

The Potomac Copper Company have recently increased their mineral property. They have become possessed of the mines owned by the Isabella Copper Company, and the Davis Copper Company, situated in Polk county, Tenessee, being each about three-fourths of a mile in length on the vein. The ore is a rich black oxide, yielding from fifteen to forty per cent. of copper. The mines are easily opened, and can be cheaply worked, there being but little rock to blast, and water power in abundance at command. A smelting company has been formed to take all the ores of that district, and reduce them to a regulus of 60 a 70 per cent., which will reduce the charge of transportation.

The Potomac Company have also obtained the "Coffin Mine," on the Deep River in Jamestown, Guildford county, North Carolina. The Central Rail Road passes through this property, and the Deep River bounds it on one side, furnishing abundant water power.

AGATE HARBOR.

There is a point in this region that is beginning to attract considerable attention, and that is Agate Harbor, some six miles below Eagle Harbor. It is said to be more easy of access than Eagle Harbor, commodious and safe, and, as it will accommodate a number of promising mines in the vicinity, it will be likely to grow into a village.

The best feeling prevails throughout the mining country, in view of the promising appearance of the mines generally, and preparations are every where being made for more extensive workings this fall and the coming winter.—*Lake Superior Journal.*

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

SHIPMENTS OF LEAD FROM GALENA.

The amount of lead actually shipped from the mines at Galena, from January 1841 to December 1852, has been as follows:—

Years.	Pigs of Lead.	Years.	Pigs of Lead.
1841	452,814	1847	771,679
1842	447,859	1848	680,24[illegible]
1843	561,321	1849	628,934
1844	624,601	1850	569,521
1845	778,460	1851	472,608
1846	780,714	1852	400,000

Owing to the obstruction of the stream by ice, these shipments are made in nine months only, and sometimes less. The decrease for the last years has been caused, first, by laborers going to the war in Mexico, and afterwards to the gold mines of California.

As a pig of lead will weigh, on an average, 70 lbs., it appears, from the above table, that the annual produce has varied, in the twelve years enumerated, between nearly 54,000,000 lbs. and 28,000,000 lbs.

SPECULAR GALENA.

Specular galena consists of an extremely thin coating of lead on quartz or some other substance, and exhibits an appearance of polish and lustre, from which the name of slickenside, or looking-glass lead ore, has been derived. It is found principally in the mines of Derbyshire, though it has occasionally been met with in some other localities.—*London Journal.*

STATEMENT OF THE ULSTER LEAD COMPANY.

October 13*th*, 1853.

To the Stockholders.—Gentlemen,—Inquiries having been made by several stockholders relative to the condition of the affairs of this company, I have, at the suggestion of the trustees, prepared the following statement:—

Location and Superintendence.—Your property is located at Ellenville, in the county of Ulster, in this State, on the banks of the Delaware and Hudson canal, ninety-two miles distant from this city. The management, at Ellenville, is under the direction of Capt. R. H. Rickard, a practical miner, of great ability and undoubted integrity.

Mines.—There are two mines on the property of the company: one known as the Old Ellenville Mine, and the other as the Ulster Mine. The Ellenville Mine was known as an old abandoned mine previous to 1712; relative to it, Captain Rickard, in a recent letter, writes as follows: "Last week we resumed operations at the 'Old Ellenville Mine.' The vein runs parallel with the Ulster vein, and bids fair to be very productive. We are clearing off the dirt from the top of the vein, preparatory to sinking a new shaft. In doing this work, we have discovered some beautiful pieces of lead and copper ore, weighing from one to fifty pounds. So far, our prospects are very flattering, and I should not be surprised to see the 'Old Ellenville Mine' yielding equal to the Ulster proper."

At a later date he writes, "We have commenced sinking our shaft, and we undoubtedly have a fine vein."

The Ulster Mine has been a series of surprises to all but Capt. Rickard; he has all along confidently predicted the present astonishing results, as his letters on file in this office will show. On the 23d of June last, Capt. Rickard replied

to some inquiries relative to the mine, as follows: "The full extent of the main drift on the course of the vein, is 173 feet. With the exception of 37 feet, the whole of this distance has been driven on a vein of pure lead ore, varying from four inches to six feet in thickness. The last twenty feet that have been driven, average fully four feet in thickness. From the commencement of the adit level to the present time, we have a constant and regular improvement in the vein. The vein in the Ulster is entirely different from the lead mines of England, or those that I am acquainted with in this country. Here, when I speak of a vein being six feet in thickness, it is all solid lead ore —galena—without any refuse. In other mines the lead is disseminated through a veinstone, and when a vein of a certain thickness is spoken of, it is probably two thirds refuse stone. Forty-two feet from the top of the engine shaft, there is a large cavern. It is rather a difficult matter to give the amount of copper and lead ore discovered in this place. In one part of the cavern, the vein is FIVE FEET in thickness, pure yellow sulphuret of copper. In one end of the cavern, there is a vein of pure galena, over four feet in thickness. There is another opening to this cavern at the end of the upper level, one hundred and seventy-three feet from the shaft. The lead ore now developed, is not less than two thousand tons, and that we have an immense amount of copper ore, I am perfectly certain."

On the 13th of September Capt. Rickard writes, "We have just struck the cavern in the lower level, sixty-eight feet below the upper level. This is something we have been looking for for some time. We have discovered it at last. Who is the man now that has a doubt of the riches of the Ulster Mine? It goes beyond any thing that ever came under my observation before. I do not hesitate to say, that the Ulster is the richest mine that has ever been opened in the United States."

Copper.—On the 19th of September he writes, "I shall be ready to make a shipment of seventy-five to one hundred tons of copper ore in the latter part of October or the first of November;" and on the 23d he says, "We have commenced taking out copper ore. We are getting FIVE TONS A DAY." On the 1st of October he writes, "We have twenty tons of copper ore WASHED and DRESSED, ready for market; it will yield certainly 30 per cent. of pure copper:" at the same time he says, "But for the necessity of timbering up the sides, we might easily get out ten tons of copper a day, but I think in the course of a week or two we shall be able to get on much better. I am fully satisfied that this cavern, where we are getting out copper, extends SEVERAL HUNDRED FEET, and I don't think it possible to clear it in TWO YEARS, just from what we see of it now. The deeper we go down, the richer the mine grows."

There is a large specimen of lead ore (galena) taken from the vein in the upper level of the Ulster Mine, now on exhibition in the yard (on the 40th-street side) of the Crystal Palace.

Results.—The first shipment of pig lead from your smelting works at Ellenville was made on the 10th day of June last. The entire shipments in the month of

June,	were	43,835	pounds.	Sold in	this	city for	$2,410 10
July,	"	54,779	"	"	"	"	2,840 80
Aug.,	"	75,360	"	"	"	"	4,052 87
Sept.,	"	132,228	"	"	"	"	7,895 25

The agents for the sale of the lead are Messrs. Frost & Forrest, No. 146 Pearl-street. The principal buyers have been James McCullough, Esq., Messrs. Thomas Otis, Le Roy & Co., Messrs. Battelle and Renwick, and Messrs. Tatham Brothers.

It will be necessary to suspend smelting operations for several days this month, to permit the erection of an additional furnace. This will probably reduce the product of pig lead for October to about (100,000) one hundred thousand pounds, but the effect of the additional furnace, it is believed, will materially increase the product hereafter.

The estimates for October are:—

Pig Lead - - - - - - -	$6,000
Copper Ore - - - - - - -	10,000
	16,000

From a consideration of the foregoing, it is manifest that a handsome dividend will be declared in February next, as the expenses never have exceeded three thousand dollars a month, and with the exception of a mortgage of twenty-five hundred dollars, (for which the holder will not receive payment), the company owe no debts of any sort.

Respectfully submitted,
T. H. BUTTERWORTH, *Treasurer.*

MISSOURI LEAD MINES.

The mines at which operations have been more recently commenced are located at Potosi, and very near to the St. Louis and Iron Mountain Railroad. The company working them have an office in this city, and a rich display of ore. The editor of the "Republican" at St. Louis, a very reliable print, furnishes some particulars respecting the recent operations at the mines, which are of interest:—

Although mining operations have scarcely commenced, yet the yield of lead so far has been more than sufficient to pay all mining expenses.

The scarcity of vessels at New Orleans has prevented the company from making any shipments of lead, till quite recently some thirty thousand pounds were shipped at Cincinnati which have probably reached New-York before this time.

The balance of the company's lead, now at Selma, will be shipped the same way.

So productive has this mine proven, with an almost certainty of a much greater yield when fairly developed, that another company, called the "Missouri Lead Company," has been organized in the city of New-York, and has purchased a tract of valuable mineral lands adjoining the Potosi Lead Company, for the purpose of being thoroughly and energetically worked.

In running in the levels for the drainage of the mines, we noticed some weeks ago a great many "lodes" have been cut through or rather "across." No attempt has yet been made to follow these further than they are exposed by the running of the shaft or level, yet the productiveness on this limited scale is as above stated. We are much gratified with the effect already produced. Of the existence of immense deposits of lead and other minerals, there has never been a doubt on the mind of any one who has seen the country or knew any thing of the imperfect mining operations there. But we almost despaired of seeing them in our day developed, because of the absence of the necessary capital and enterprise.

In the same respectable quarter, we are furnished with some facts respecting the more recent operations in the old "Mine La Motte;" the early history of which is narrated in Schoolcraft's "Scenes and Adventures in the Semi-Alpine Region of the Ozark Mountains."

The history of the Mine La Motte tract should be written, for it would show, better than any other illustration, the extent and variety of the mineral deposits in our State. This much we may say from our own knowledge, and yet we know but little about it.

This tract was worked in the early days of the Spanish settlement, entirely for its lead. Much of the league square was dug over for this ore alone. At a later period, it was discovered that the early miners had thrown aside an immense amount of valuable mineral, in what is, in the western mining districts, called "dry bone." The large amounts of this made it an object to work over

the earth thrown from the mines. In process of time, it was discovered, in working over the earth thrown out from the old mines, or diggings, that it contained two other important metals, to wit, nickel and cobalt—minerals valuable in manufacturing, and which obtain a high price in the market. These discoveries made the old leads even more valuable than they had been before. In addition, an English miner discovered a lead of copper, and by an arrangement with the then proprietors, the working of it was commenced, and has since been successfully prosecuted. The Messrs. Fleming, of Philadelphia, who are now the owners of the whole tract, have found it profitable to erect works to disintegrate the copper from all other substances, in Camden, on the chemical principle employed in Europe, and are carrying it on to a very large extent. Without intending to go further into the interesting history of this tract, we allude to it as a case in point to prove that it was not until a very few years since that the value or variety of the mineral deposits were known. Their extent is not yet to be ascertained, for the enterprising proprietors have found it sufficiently lucrative to confine their operations to what appears on the surface or very near it.

Now, the whole of the southern portion of our State bears a strong analogy to the Mine La Motte, but it may be that it is not as rich; but it is certain that minerals abound every where. In addition, clays, suitable for the manufacture of ware, are found in abundance. Sand, for the manufacture of glass, is taken from the vicinity of St. Genevieve and Pittsburg and Wheeling, and returned to us in glass.

VICTORIA LEAD COMPANY.

The office of this company is in the City of Boston. The officers are John A. Andrew, President; Geo. W. Collamore, Secretary; Geo. L. Schlatter, Executive Director at Ogdensburg. From a report made by the officers of the company we gather the following particulars:—

This corporation was created under the laws of New-York, in August, 1853. The mines are in the town of Rossie, St. Lawrence County, New-York, about 27 miles from Ogdensburg. There are two large and exteneive veins, one of which has been partially opened, and about $30,000 of lead taken therefrom by a former company. It is estimated that over $25,000 worth of ore is now exposed for mining above the first level. The extent of vein proved in length 1200 feet. It is estimated that $6000 will complete the necessary erections of machinery and buildings for the next twelve months. The mines have been visited by a great number of scientific and practical geologists and mining engineers and agents, all of whom express entire confidence in their success if judiciously managed.

The following is from the report of A. C. Farrington, Mining Engineer:—

The surface appearance, or indications of the mine, shows the outcrop of two veins intersecting or diverging from each other at an angle of about ten degrees. The different veins are distinguished by the names of the Union and Victoria veins. The Union vein having a course of about south, sixty degrees east. The Victoria, south, seventy degrees east. Most of the workings are upon the Union vein. Four shafts have been commenced upon this vein, which I shall designate by the numerals 1, 2, 3, 4; calling the easterly number 1; the next number 2; and in that order to number 4, the most westerly of all. Numbers 1 and 2 are sunk a little below the 100 foot level. Number 2 is 110 feet from the surface, or 10 feet below the lower level. The lower gallery has been cut about 300 feet, 20 fathoms of which has been stoped. The gallery east of shaft number 1, has been driven upwards of 30 feet, and is through a vein of nearly 4 feet wide, consisting of calcareous spar *richly charged with galena;* and I fully concur in the estimate made by Captain Dunkin, the intelligent captain of the mine, in reporting it worth $100 per fathom, and when the vein is stoped

above this level, large quantities of galena will be obtained. Between shafts numbers 1 and 2, there is 120 fathoms ready for stopeing. West of number 2 shaft, the gallery has been driven about half-way to the point where it will intersect shaft number 3. The lode was not rich at the commencement of the gallery, but the last 30 feet exhibits a marked improvement. West of shaft number 2, at the surface, is a stope 40 feet in length, and 20 in height, in which the lode is over 3 feet wide, worth $80 per fathom.

I am fully satisfied the Union vein is a *true, persistent, and continuous lode, and will amply reward with a rich return of metal, a judicious and systematic course of mining*, and the sooner such a system is resorted to, the greater advantages will be derived by stockholders or owners. The cautious policy so commonly acted upon by adventurers in mining enterprises, of insisting upon extensive surface explorations being made, and shallow pits sunk, to satisfy the doubts of some timid stockholder of the actual existence of a vein, involves ruinous expense that might have been avoided. And as regards lead mines, all are familiar with their history in Wisconsin and Iowa, and having heard that deposits in those States often are exhausted, fear it may prove so with others. They do not consider *there is a difference between a vein of metallic ore, and a deposit or bed lying in a nest conformable with the strata of rocks in which it is found*, and that a vein cuts through strata nearly at right angles with their planes. A bed or deposit, if worked, must necessarily become exhausted; *a true vein never can be, or at least never has been.* Engineers and inspectors, when called upon to examine mines, are also timid (even though satisfied from examination that the lode is rich), in recommending a course of working they would adopt for themselves. They dread the responsibility of recommending an outlay of money by owners that may render them impatient for return. *The Union Mine is not such a one as should deter a practical miner from putting in such work as will serve for a long period of time for raising the ore. I have no fears the vein will ever become exhausted, or the bottom found;* and as the history of all metallic veins show the deeper they are penetrated the richer and more abundant the mineral becomes, the natural conclusion must be, that if unskilful miners or laborers could do a profitable business mining upon the surface, in the rude manner the mine was once worked, scientific and systematic efforts, with the aid of machinery, will render it much more so.

The force employed about the mine while I was there, consisted of sixteen miners, one blacksmith, eight laborers, and five boys, at an expense of about $900 per month.

With a suitable engine for draining the mine, it ought to pay its current expenses from the sale of the mineral, or nearly so, although three-fourths of the effective force at present employed are engaged on preparatory work, sinking shafts, and driving galleries. *In a few months it can be put in a condition to employ one hundred men in stopeing;* when, if its present indications are not falsified, the mine must prove highly remunerative.

The following is from the report of Dr. Charles T. Jackson, made in August, 1853:—

West of Collins' shaft, 550 feet distant from it, the vein runs 56 deg. 5 min. east, and dips 80 deg. to the southwestward. It is flanked with brown "gossan" ochreous rock in a decomposing state. The lode is from 2½ to 3 feet wide, 10 feet from the surface, and the yield is estimated at 15 per cent. of galena. This vein is one of much promise.

On examining the ore heaps at these mines, I observed that there was but very little pyrites or blends mixed with the galena. So it is very easy to smelt in the common Scotch furnace. It is readily washed clean from the spar by water after the vein stuff and lead ore are crushed. The most simple working machinery is employed, consisting of nothing but a common strake and a shaking table, the latter being employed to separate fine particles of lead ore in the waste from the strakes.

It is estimated that one gang of four miners can stope out four fathoms of the vein per month, and that this amount of vein stuff will yield eight tons of pure galena or lead ore.

The average yield of the ore in the Scotch furnace is 60 per cent. of lead, and some of it yields as high as 65 per cent.

One Scotch furnace will smelt 20 pigs of lead per day, each pig weighing 70 pounds. There are three of these furnaces in the smelting house. The time estimated as a day in the furnace work is ten hours, which is as long as men ought to work amid the fumes of lead and of sulphurous acid gas.

IMPROVEMENTS IN THE SEPARATION OF CERTAIN METALS FROM THEIR ORES OR OTHER COMPOUNDS.—[*Patented by Alexander Parks, of Caermarthen.*]

The first of these improvements consists in the separation of gold and silver from their ores, or other compounds, by means of sulphuret of iron, oxide of iron, and carbon employed in conjunction.

The second improvement consists in the use of sulphate of lime or sulphate of baryte, together with oxide of iron for the same purpose.

The third improvement consists in reducing silver from its ores by one fusion with oxide of iron, carbon, and fluor spar or lime.

The fourth improvement consists in effecting the separation of gold from its ores by means of metallic iron melted therewith, and afterwards separated from the gold which will have entered into combination with it, by sulphuric or muriatic acid.

The fifth improvement consists in separating gold and silver from their ores or compounds, by means of the sulphurets or arsenical compounds of nickel or cobalt.

ON THE PREPARATION OF PURE SILVER FROM CHLORIDE OF SILVER, BY C. BRANNER.

It has long been known that pure silver for chemical purposes is best prepared by the decomposition of chloride of silver. This decomposition can be performed in various ways: Poggendorff, several years ago, described a process in which it was effected by galvanism; this appears to me to be preferable to all others hitherto known, and the one here described can only be regarded as a modification of it. Well-washed precipitated chloride of silver is to be put into a cup of silver, platina or copper, the outer surface of which is covered with wax, in such a manner that only a round space of one or two inches in diameter, according to the size of the cup, remains uncovered. On the bottom of a larger earthen cup, a disc of amalgamated zinc is to be laid, on the middle of which the cup containing the chloride of silver is placed, in such a manner that the portion not covered with wax may come in contact with the zinc. Water slightly acidulated with sulphuric acid is now poured into the apparatus, until it rises above the margin of the inner cup, so that this will be completely sunk in the water. The decomposition of the chloride of silver immediately commences at the edge of the cup containing it, and proceeds inwards to the middle; this is readily known by the dark gray color assumed by the silver as it separates; the decomposition will be completed in from 24 to 48 hours; its completion may be known by there being no longer any chloride of silver visible on stirring the precipitate. The silver thus procured is to be washed with water, and any small residue of chloride of silver which it sometimes retains may be got rid of by diluted ammonia. The silver thus prepared is perfectly pure. It is readily seen that any foreign metals that may be contained in the zinc, can never mix with it, as the disc of zinc lies during the whole operation below the cup containing the silver, and never comes in contact with it.

SEPARATION OF SILVER FROM OTHER METALS.

The following is an abstract of the specification of a patent granted to Alexander Parks, of England, for improvements in the separation of silver from other metals. The invention consists—first, of certain improvements in the mode of employing zinc for the purpose of separating silver from lead. Secondly, of improvements in separating the silver from the alloy of zinc and other metals thus produced. The patentee states that he has found when lead contains 14 ozs. of silver to the ton, the most suitable proportion is 1 per cent. of zinc; thus, for each ton of lead containing 14 ozs. of silver, he uses 23 lbs. 4 ozs. of zinc; for each ton of lead containing 21 ozs., 33 lbs. 6 ozs. of zinc; and for each ton of lead containing 28 ozs. of silver, 44 lbs. 8 ozs. of zinc. The process is conducted as follows:—The lead, in the state it is received from the smelting-house, is melted in an iron pot, and heated to the temperature of melted zinc; the zinc, in a melted state, is then added, and the whole well mixed; the contents of the pot are then stirred in the usual way, with a piece of green wood, to remove any impurities; it is then cooled; the alloy of silver. zinc, &c., rises to the surface, and is removed by the means of ladles pierced full of holes. A previous assay of the lead will indicate the right proportion of zinc to be employed; a larger quantity will be found necessary in cases where the lead is very impure. The lead which has thus been desilverised by means of zinc, often retains a small portion of that metal, which has the effect of rendering it brittle: this defect is remedied by the following process:—

The melted lead is run into a reverbatory furnace, and raised to a dull red heat, when the zinc rises to the surface and becomes oxidized; the furnace is then tapped, and the lead run into an iron pot, when it is stirred with a piece of green wood, to remove any oxide of lead which may have formed; after which, it is ladled into moulds in the usual way. By this means, 3 tons of lead may be deprived of the zinc it contains in the course of from 2 to 2½ hours; the surface of metal exposed being from 25 to 30 square feet. The oxide of zinc remains in the furnace, whence it may afterwards be removed.

In order to separate the silver from the other portions of the alloy, the patentee proceeds as follows:—The silver is first concentrated by removing as much of the lead as possible, by placing it in an iron pot, the bottom of which is perforated with holes, the top being, at the same time, covered with a tight-fitting lid; heat is then applied, and when the metal is nearly red hot, a large quantity of the lead in the alloy will escape, and thus the mass of alloy will become much reduced in size. If care be taken that the heat be not carried to too great a degree, the lead which thus escapes will be found to contain but a very minute quantity of silver. The alloy thus concentrated may next be treated by either of the following methods: First, the alloy is placed in closed retorts, or muffles, and exposed slowly to a low heat, and continually stirred, by which means the metal is partly oxidized and falls down in fine powder; the heat is then increased, and when all the metals (except silver) in the alloy become completely oxidized, the whole is transferred to tanks containing dilute sulphuric or muriatic acid, which dissolves the oxides, leaving the silver in the metallic state. Secondly, the alloy is placed in suitable retorts, or distillatory apparatus, formed of Stourbridge clay, or of iron set in clay retorts, and lined with powdered bone and charcoal, and by which means the zinc is distilled off in the usual way, after which the back part of the retort is tapped, and the residue treated by cupellation, in the way well known.

By the process of desilvering lead, known as that of Pattinson's, many of the English lead mines which are now workable with profit, must otherwise have been abandoned. The chief ore from which lead is extracted is that known as galena, or the sulphuret of lead, furnishing from 75 to 80 parts of the metal according to purity. It usually, though not always, contains silver in various proportions. Upon the quantity of silver often depends the profitable raising of the ore. Previous to the invention of Mr. Pattinson, about 20 ounces of silver in a ton of lead were required to render the extraction of that metal

worth the cost; since then, as little as three or four ounces in the ton of lead will repay extraction. Now, as so many ores contain small quantities only of silver, the importance of the process is evident. In a scientific point of view it is one of much interest, as it consists in so conducting the work that portions of lead can be crystallized, by which the silver becomes excluded, in the manner in which in many crystallizing processes, foreign substances are excluded during crystallization; thus by degrees a mixed mass of silver and lead is left, extremely rich in the first metal. When this richness in silver arrives at the point desired, that metal is extracted in the usual manner by cupellation. In one of the lead works in England, in which arrangements exist by which the fumes of the furnaces are prevented from escaping, the damage to the surrounding country is obviated, and lead to the amount of 33 per cent. is obtained from the deposits or "fume."

DESILVERIZATION OF LEAD BY ZINC.

Dr. Karsten, a German chemist, several years ago made some experiments with lead and zinc, and found that when a mixture of these metals was allowed to cool very gradually, lead with a minute trace of zinc was found at the bottom of the crucible, and zinc with a small amount of silver at the top. If the lead contained silver, it was almost entirely transferred to the zinc. Hearing that in Carmarthen silver is withdrawn from lead by means of zinc, he resumed his examination of the subject.

He found that silver may be entirely separated from lead by zinc, and that the following method gives the best results:—A tube of cast-iron, 1¼ inch in diameter, is fitted to the crucible, so that the desilverized lead may be let off from the bottom. One end of this tube, dipping nearly to the bottom of the crucible, is furnished with a slide moving in grooves at the edge of the crucible, so that it can be shut, when required, by means of a rod. In this way the stream of melted lead may be regulated, and the fall of level gradual and uniform. In the crucible were put 25 cwt. of lead, containing seven-eighths of an ounce of silver to the cwt., and 4 cwt. of zinc. The whole was then fused, and stirred together for one hour at a bright red heat. This large amount of zinc was used because it was intended to attempt a process of concentration, in which the same quantity of zinc should serve to desilverize subsequent charges of lead. After the stirring apparatus was withdrawn, and the melted mass kept for four hours at a red heat, the lead, perfectly freed from silver, was drawn off until only about 6 cwt. of metal remained in the crucible. To this residue a second 25 cwt. of zinc was likewise added, for reasons given below. A fourth, fifth, and sixth charge of lead was introduced and treated in like manner, 2 cwt. of zinc having again been added to the fourth charge. The lead drawn off, in each case, was entirely free from silver. But when a seventh charge was introduced without an addition of zinc, the lead, when drawn off, still retained silver to an extent of three-eighths of an ounce to the cwt. The desilverizing of 150 cwt. of lead in this manner, requires 8 cwt., or 5¼ per cent. of zinc, a quantity differing widely from that indicated by former experiments—namely, 1½ per cent.

An addition of 1½ per cent. of zinc is quite sufficient for the perfect desilverization of lead when only one charge is worked. Thus 25 cwt. of lead may very well be freed from silver by 42 lbs. of zinc, but the difficulty of separating the small quantity of argentiferous metal from the desilverized zinc is so great that this plan is not practicable. On the other hand, there is a certain limit to the size of the crucible, which cannot be exceeded, and recourse must therefore be had to a process of concentration. The silver is separated from the lead very imperfectly, if twice or thrice as much zinc as is required for one charge of lead is added at once, with the view of making it serve for several charges. It is likewise imperfect when, on introducing into the crucible the several charges of lead, the 1½ per cent. needed for desilverizing the lead is added with each charge. If, therefore, with reference to the above example,

the first melting is made with 25 cwt. of lead and 42 lbs. of zinc, the second, third, fourth, &c., charges (added to the residue in the crucible) must also consist of 25 cwt. of lead and 42 lbs. of zinc. The cause of the unfavorable result of the process attempted by the author, lies in the necessity for stirring the melted metals. The oxidation of the lead and zinc at the surface of the mass is very disadvantageous.

The argentiferous zinc obtained by this process always retains a portion of lead sufficient for the refining of the silver after the zinc has been separated from the mixture; and the alloy of silver and lead remains in the distillation muffle. If the percentage of lead is not sufficient for this purpose, more must be added, in order that in the distillation vessels the silver may be accumulated in the lead, which is afterwards cupelled. The distillation does not present any difficulties when suitable muffles are employed. The author had muffles constructed which, except a slit ¼ of an inch in diameter, were quite closed for a height of 4 inches from the bottom. The slit could be closed and reopened in the usual manner, when the distillation being completed, it was necessary to draw off the remaining argentiferous lead. Such a muffle was charged for each distillation with 1 cwt. of the metallic alloy of zinc, lead, and silver. The product of four distillations of a mixture which, according to the most careful assays, contained 47½ ozs. of silver, was 242 lbs. of lead and 44 9-44 of silver. The loss of silver amounted, therefore, to 3 1-22 oz.; this is owing chiefly to the scattering of small globules in the muffle, and it partly remains in the scum, from which it may be again recovered by subsequent distillations, washings, &c.

COALS AND COLLIERIES.

ANTHRACITE COAL TRADE FOR 1853.

	Tons.	
Amount shipped from Richmond to the close of the week ending Oct. 8th, 1858,	905,186	
To the same time last year,	1,047,410	
Decrease last year,	142,223	
Amount sent by Railroad, to Oct. 14th,	1,326,240	11
Ditto by Schuylkill Canal,	683,369	10
Total by Railroad and Canal,	2,009,610	01
To same period last year,	2,049,541	17
Decrease this year,	39,931	16
Lehigh coal trade to the close of the week ending Oct. 8th, 1858,	792,378	06
Ditto last year,	870,478	00
Decrease this year,	78,099	14

Rates of toll and transportation on Railroad, to Dec. 1st 1853:—

From Mount Carbon to Richmond,	$2.00
" Schuylkill Haven to "	1.95
" Port Clinton to "	1.75
" Mount Carbon to Philadelphia,	1.85
" South Haven to "	1.85
" Port Clinton to "	1.6[illegible]

Rates of toll by Canal until close of the season:—

From Port Carbon to Philadelphia,	1.00
" Mount Carbon to "	98
" Schuylkill Haven to "	95
" Port Clinton to "	85

Rates of freight by Canal:—

From Port Carbon to Philadelphia,	65 to 75c.
" Mount Carbon to "	65 to 75
" Schulkill Haven to "	70 to 80
" Port Clinton to "	00
" Port Carbon to New York,	$1.70
" Mount Carbon to "	1.70
" Schuylkill Haven to "	1.65
" Port Clinton to "	0.00

THE SUPPLY OF COAL.

We are already gaining on the shipments of last year, and the supply from this region is short only 39,931 16 tons. If no accident should occur for the balance of the season, we *may* send the same quantity to market we did last year.

The trade for the Lehigh shows a falling off in the supply of 7-,100 tons. From the Lackawanna Region we have no late returns. The increase from that quarter this year, will be about 75,000 tons only.—*Pottsville Miner's Journal.*

CUMBERLAND COAL TRADE.

Shipments for the week ending Oct. 14th, 1853:—

	Tons.
From Frostburg Region,	10,786
" George's Creek,	2,786
" Western Port Region,	
" New Creek,	232
" Llangollen,	61
Total,	13,865
Thus far this year,	893,865

Shipments for the week ending Oct. 8th, 1853:—

	Tons.
Frostburg, C. C.,	1,666
Borden Mining Company,	1,866
Alleghany Mining Company,	1,340
C. C. and Iron Company,	5,103
Percy & Co.,	333
Thos. Kerr,	423
Parker Vein Company,	1,276
Swanton Company and Iron Company,	750
George's Creek Company, and Iron Company,	601
Phœnix M. and M. Company,	159
	13,572

THE LLANGOLLEN COMPANY.

This company, chiefly managed by Dr. James Wynne, is now beginning to send coal to market. The seat of their present operations is at the mouth of Savage, although they own a valuable property of the big coal vein in the George's Creek Valley, which they will probably commence mining next spring. The Company have created quite a village at their present mines by wisely disposing of lots at low rates. Their affairs are conducted on an economical and prudent scale, and they will increase their shipments of coal as rapidly as they are furnished means of transportation by the Baltimore and Ohio Railroad.—*Cumberland Miner's Journal.*

THE INTRODUCTION OF ANTHRACITE FUEL.

Bituminous coal, or sea coal, was known upwards of a thousand years ago, in the year of our Lord 853, but did not come into general use until the 16th century, and was not used in the manufacture of iron until the 17th century. Anthracite coal came gradually into use so late as the 19th century, and was

not used as fuel in the manufacture of iron until about 16 years ago. So early as 1790, anthracite coal was known to abound in the county of Schuylkill, in the State of Pennsylvania; but it being a different quality from that known as sea coal, or bituminous coal, and being hard of ignition, it was deemed worthless until the year 1795, when a blacksmith of Pennsylvania, named Whetstone, brought it into notice. His success in burning it induced persons to dig for it, but when found, every person connected with the enterprise had to experiment on its combustion, and vain were the attempts to burn it by the majority of them, and all came to the conclusion that it would not come into general use. About the year 1800, Mr. Morris, who had a large tract of land in Schuylkill county, Pennsylvania, procured a quantity of coal therefrom, and took it to Philadelphia City, but he was unable, with all his heroic exertions, to bring it into notice, and abandoned all his plans. From that time until 1806, it was talked about as humbug; when accidentally a bed of coal was found in digging a tail race for a water-wheel, for a forge, which induced another blacksmith, David Berlin, to make a trial of it. His success was generally made known, which induced others to try to burn Pennsylvania coal.

THE DORN COAL COMPANY.

This company was chartered by the Legislature of Virginia, at its last session, for the purpose of mining coal and manufacturing iron. The property of the company is 135 miles west of Washington, and in the State of Virginia. It consists of 15,000 acres of land, in which are the coal veins.

The Virginia Central Railroad, from Richmond, passes in close proximity, Staunton station being 18 miles distant. The Manassas Gap Railroad will pass within 10 miles. The latter road is already graded to Strasburg.

The company regard their advantages over other districts to consist chiefly in the quality of the coal and the facility of bringing it to market. As to the quality of the coal, Dr. Chilton states the analysis of a sample to have presented carbon, 92.98; ashes, 3.58; water, 3.44. The company estimate the cost of mining and expense to Alexandria at $1 85 per ton, giving them an advantage of between $1 and $3 over the anthracite at present in that market, and $1 in freight over Cumberland.

The following remarks are from the columns of one of the weeklies located in the neighborhood of this coal district—*The Virginian.* They certainly speak in high terms of anthracite:

In all old gazetteers, geographies, &c., the coal mines near Richmond figure as one of the wonders of that city and the State. They were long the most extensive, and at one time the only mentionable workings in the Union. Their produce was very nearly as great as it is now, when Schuylkill anthracite was a mineral curiosity in Philadelphia; when the Ohio steamboats poured out volumes of wood-smoke over hills half formed of the "black diamond;" and when the salt-boilers on the Kanawha were on the point of abandoning their furnaces, because the forests at their doors had been consumed, not yet dreaming that the roots of the trees they burned twined among some of the richest coal seams in the world. Now wood is a rare fuel on steamers above the falls of the Ohio. Coal is used in most of the interior towns of the West; and the annual consumption east of the Alleghanies is about six millions of tons; while the Richmond mines yield only one or two hundred thousand tons, and are remarkable for little else than their depth. The causes which have checked their progress are various. Prominent among them is that which has cramped most enterprises in the South—dependence on negro labor, so unintelligent, inadaptive, and limited in supply. But a principal reason, we think, is to be found in the fact, that bituminous coal, of which the Chesterfield deposit consists, has never been very popular in the Atlantic States for general purposes. Anthracite has steadily superseded it for warming houses, and driven it to the furnace

of the steam engine, gas works, &c. It is now increasingly preferred for machinery even. Many of the New-York steamships, and some locomotives on the Reading, and perhaps other railroads, burn anthracite. It is the principal fuel in Baltimore, now the principal depot of the bituminous coal of Cumberland, and is largely consumed in Alexandria and Richmond, and other places, where its cost far exceeds that of fat coal. In Winchester its price is nearly double, and yet is generally preferred when it can be had. It gives more heat, burns much longer, and requires little or no attendance.

The rapid increase of the exports from the Cumberland region does not disprove the supremacy of anthracite. Their whole amount this year will not equal a tenth of the product of the latter. They will continue to increase, and rapidly; for the demand is large for both, and there are objects to which bituminous coal is alone applicable. We need not remark that in the West they have no anthracite, and the other kind is furnished at a hundred points for a dollar and a quarter per ton. The cannel coal of the Kanawha, which has some of the best qualities of anthracite, is said to be readily sold on the Ohio and Mississippi, at twice or thrice the regular rates.

Pennsylvania has hitherto had the monopoly of this most important mineral, and has, of course, profited accordingly. A few detached and imperfect beds have, we believe, been open for years elsewhere; but they were quite insignificant in comparison with those of the Keystone State. The same range of hills and rocks, however, which contains the latter, runs along the eastern base of the North Mountain through Virginia, and in them the coal seams were expected to recur. At several points on that line, in Berkeley, Frederick, Shenandoah, Rockingham, and Augusta, small seams have been met with from time to time, and in a few cases worked. But the quality has until now proved inferior, and the seams thin and local. It appeared to improve towards the south; and the most promising signs were on the head-waters of Cedar Creek and in Brock's Gap. All these, however, are said now to be thrown in the shade by the discoveries made a year or two ago in Augusta county, near the Rockingham line. We published the result of the first explorations at the time.

SHAFTS, WAGES, ETC.

To the Editor of the "Mining Magazine:"—

SIR:—I venture a few lines as a check on those who carelessly or otherwise forward matter for publication which is not correct. It strikes me your intention and desire is to have a work *of real use to the country*, not a mere pastime for readers and writers, and that you had rather an error should be shown in a subsequent number of your own, than by a reference of the reader to other works, or to his own knowledge of the subject. You will in this light excuse some suggestions of mine. It will strike any one, even ignorant of mining, who opens your number for August, that the ventilating furnace, shown on the fourth page, can only be injurious if the pit top shall remain uncovered. The most approved mode of landing up shafts is by carriage for the car with guides of timber,—iron rods or chains are used for the carriage. The mouth of the pit may be of the exact size with the floor of the carriage, so that no air can pass down the pit when the carriage is up; and over the carriage, attached to the rope, there may be a cross which shall lift a lid or cover of the shaft—through which the rope and guides pass—as the carriage rises at the top. I do not enter upon modes of applying *urgents* to the air of mines, but merely say this for the other reasons stated. I shall treat of *longwork* and ventilation together.

Having, probably, opened or "set to work" a greater number of seams of coal and ironstone and iron works in several districts of England and Wales than any other man, as I may prove to your readers, and reported on as many mines, and having closely witnessed several of the largest and most successful works in Britain, as well as the greatest blunders of the coal and iron trades; all which last, in every case, arose from the reliance of capitalists upon

the pretended knowledge of book-learned theorists; I may (by your leave and favor) in some shape trouble yourself and the public with working experience, and compare it with that of this country perhaps, under such a heading as "Half a Century spent in the Mines and Iron Works of Britain." But, Mr. Editor, you must not expect me to allow untruths as well as errors to *mislead* your readers with impunity. I shall not require the reader to receive my word as evidence, but will give facts and public statements, &c. I must notice first that most *injurious* idea, continually promulgated here, that the iron, &c. of Britain is the product of "pauper labor." You give the average of the wages of *persons* (man and boy) employed in the Cornish mines, at three shillings English, or seventy-five cents per day. This is a dollar per day for a man, and a half for boys and old men. Cornwall is near the counties of Somerset and Devon, where the lowest farm wages, and the lowest prices of farm produce prevail; but in no other mining district, except the west of Wales, are wages so low. My part is to prove that it is *knowledge*, not "pauper wages," which gives England the lead. Your newspapers only mislead as to Britain. She obtains iron for making steel from Sweden, where wages are about *one-third* the rate at which they are in Sheffield, yet this iron is *returned* in knives. Is it a wonder, then, that Sheffield supplies the States? The said dollar per day cash, enables a man to live better than does the $1.50 of miners in the States, where it is chiefly store pay. Governor Johnson touched the right string in his address at Carbondale, respecting the tariff on iron, and the iron masters of the States. He used the words "Ignorance of their business." Is it to be suffered that smiths here should pay *five times* the price in England for iron? There is a rolling mill in Kitanning, and he knew what he talked about.

The Pennsylvania Coal Company do not seem to regard the small item of half a year's work of coal as worth a line by itself, but mix it up with the cost of the subsequent year's work; thus making a total in the first line of their statement up to May last, of $306,193 91. The value of the stock of coal in May, 1852, is thus left in darkness; but if it is (as it must be) nearly the same as the amount given for May, 1853, then deducted from the amount above, there remains only $89,678 39 for the 426,164 tons of coal worked and bought by that company last year. · This is 21 cents per ton.

The interest of their mortgaged and floating debt (nearly $800,000) is stated at $30,273 65, or four and a half per cent.

I suppose Port Ewen means Hawley; and if so, the $39,335 63 stated as expenses, give nine cents per ton for the work of tipping the car-loads into boats, which should not cost in labor one cent per ton. Loading stock or dumper coal, with their site, should not cost three cents per ton on their entire sales.

They advertise ten days, or thereabouts, as the average time per trip of their boats; but ten trips per boat, or 1000 tons each year, is not far from the actual amount transported by each, which gives 426 workable boats for their 426,000 tons. They value their interest in boats at $445,575 54, or $1000 each for the boats required; and how much have individuals paid towards making the boats theirs, at $18 per trip?

The payment to the Hudson and Delaware Company as tolls, on 108 miles, with the above-mentioned interest on the debt, takes half their income; yet they make dividends amounting to $233,730 00. I merely touch on heads, any boy can examine. I believe the company would rather it were done here than in England. The real improvement and value of their mines is a more intricate matter.

COAL FIELDS AT THE CAPE OF GOOD HOPE.

A company has just been established in England, which promises to afford a wide scope for investment, and, if conducted with energy and economy, to become a sphere of successful and profitable enterprise. The undertaking has been formed with a view to the working of the coal fields at the Cape of Good Hope and Natal, and also for general mining purposes. It is well known that

coal exists in great abundance in these localities, and, according to the evidence of Sir H. G. Smith, late Governor of the Cape of Good Hope, the Rev. Dr. Adamson, and others, is of excellent quality. It is also believed to be principally on the surface: and, if so, there will be a vast saving of expenditure, as regards labor and machinery. The coal-fields intended to form the basis of the operations, are of vast extent, and the incidental expenses, such as surveys, selecting locations, and securing legible territory, will, it is estimated, be exceedingly moderate. The undertaking is certainly one of considerable importance, and if, as we have already intimated, it is managed with prudence and skill, will, in all probability, afford a fertile field for the employment of capital.

COLLIERY OPERATIONS—LAMPS AND CANDLES.

EXPENSES ON SAFETY LAMPS.

To maintain and keep in good repair a sufficient number of safety lamps to work 100,000 tons per annum :

220 lamps in daily use on 300 working days per annum, 1050 gallons of oil, at an average of 2s. 10d. per gallon,	£148	5	0
60 new lamps per annum, at 6s. 3d.,	18	15	0
70 lbs. of fine cotton, at 1s. 4d. per lb.,	4	13	4
Wire gauze, wire for poles, solder, tools, &c.,	10	0	0
Wages: to oiling, trimming, and keeping the same in good repair, at 12s. per week,	31	4	0
To locking lamps underground, 300 at 6d.,	7	10	0
Total,	£220	7	4
Cost of each light per day, 0.80d.			

EXPENSES ON CANDLES.

To maintain 200 lights per day: 180 workmen, averaging 10 hours per day, using six candles each, of 30 to the pound; 40 boys averaging 12 hours per day, using seven candles each, of 30 to the pound, equal to 45¼ per day, at 6d. per lb., by allowing 300 working days per annum .	£340	0	0
Wages to one man for taking charge of these candles, and serving them out, at 12s. per week,	31	4	0
Total	£371	4	0
Cost of each light per day, 1.84d.			

W. GRAY, Morfa Colliery.—*London Journal.*

REPORT OF THE PARLIAMENTARY COMMITTEE ON EXPLOSIONS IN COLLIERIES.

The following epitome of that portion of the evidence given before the Parliamentary Committee of England, by the government inspector, Mr. Dickinson, contains some valuable facts in relation to colliery operations. Ventilation formed, of course, a most important element in the inquiry of the committee, and in its consideration are necessarily comprised the natural differences in roofs, the attendant dangers, and the most improved and secure methods of underground working in its several branches and details:

In his testimony, Mr. Dickinson, the government inspector, recommends in fire-damp mines to drive on the galleries to the extremity of the mine, and to work the coal backward, as this insures a permanent air-way at all times; and he would prefer this system, whether the seam was perpenpicular or horizontal; conceiving that there are no greater difficulties in ventilating a mine with air-ways in solid coal, than in air-ways maintained by gobbing—that is, in the refuse or rubbish thrown back into the excavations remaining after the removal of the coal. There is, besides, in his view, no liability to leakage, if the air-ways are in the solid coal; and liability to leakage is avoided by driving out the level to the extremities, and working the coal backward. Mr. Dickinson is very decided in his approval of the long-work in collieries; and while he condemns the old system, as creating a series of unsightly caverns, he says: "It is worthy of remark, that there is no instance that I have heard

of, where long-work has been introduced, that that system has been abandoned, and the old system again resorted to." He admits that, in the beginning of working long-work, the first weight of the superincumbent strata on the face of the work, makes it dangerous for the workmen, and may crush the coal; in the course of a few days, however, after the first subsidence has taken place, the roof subsides regularly behind, and there is no more difficulty. He states that the workmen have sometimes abandoned the work until the first subsidence has taken place, and that where long-work has been attempted to be introduced into new collieries by persons who did not understand it, when this first weight has been coming on, which is the critical weight, the system of long-work has been frequently abandoned; had they, however, waited until the subsidence had taken place, their efforts might have been successful. He observes that the great difficulty is with the workmen. He considers the long-work much better for ventilation; as in working pillar and stall-work, a number of galleries are left open, and all those galleries require to be ventilated; while with the long-work you have simply the working face open, you leave an intake gallery for the air to go into, it then passes up the face of the work, and returns by the return drift; while with pillar and stall-work you have a number of galleries which require to be ventilated; and he further states, as a reason for preferring the long-work as to ventilation, that the distance which air travels in long-work is shorter than that which it travels with pillar and stall-work, because you have only the intake gallery, the face of the work, and the return air course to ventilate, and as there is no pillar and stall-work, the air has not to be coursed through. The evidence explains that in long-work there is simply a current of air going from the downcast shaft to the face of the work, running along the face of the work, which is only a channel about 6 or 7 feet wide, and returning by a drift to the upcast; while with the pillar and stall-work, if you have 20 stalls, you may split the air into four parts, each current of air, or each fourth part, has to course through four stalls, with a door between each stall; and, therefore, each current of air has to pass up one half of the stall and down the other. In the old system there is also a risk of doors being left open, while in the long-work there are no doors except there be main doors; and where the face of the coal gives vent to an enormous quantity of gas, contingencies arising out of doors are very much fewer than in pillar and stall-work, as the air is all passing up the particular places where it is required. Mr. Dickinson clearly intimates his opinion that the long-work system is in all cases more economical and safe than the pillar and stall system, and that many persons work long-work both with good and bad roofs. He further remarks, that in working the thick coal of Staffordshire, where the top part of the seam is worked first, and there is nothing but the old gob for the roof of the second working, Mr. Gibbons, whom Mr. Dickinson considers an authority in these matters, having worked the coal for several years under the long system, says he prefers a bad roof to a good one. This is explained thus: that a hard solid rock for a roof, which will not break, is apt to crush your coal, and is attended with more danger than would otherwise be met with if you had a tender roof.

He then explained that he had seen a modified system of long-work, which, although not the ordinary system of long-work, is called long-work in South Wales, practised very successfully under a quor roof. It is by driving a stall 8 yards wide, and bringing back the same width of pillars. All the coal is obtained in that working; and, perhaps, it is the only successful working of coal that there is in South Wales, for all the rest, under the bad roofs, is attended with a very considerable sacrifice of pillars; and he observed, that his remarks applied to the cleanness of working, but, generally, equally to the ventilation. Mr. Dickinson further stated, that it was a general rule that a plate roof, which usually bends rather than breaks at first, is one of the best roofs for working long-work, and that long-wall work is quite applicable to it; he does not, however seem to approve of the usual way in Staffordshire—that is, of work-

ing the upper portion first—but thinks that the best way is to work the lower part first, taking care to pack the gob very tight with rubbish. He then proceeded to detail the plan on which he would commence the long-work system. He would keep the lower levels in advance of the upper, for it was generally found that, in attempting to keep the upper levels in advance of the lower, there is a tendency to throw the weight of the roofs on the face of the work, which makes it more dangerous for the men, and also tends to crush the coal; even where the pit is sunk to the bottom of the seam, as the weight always tends to the dip, he would start the drifts, so as to keep the lower drifts in advance of the upper, and throw the weight of the work on the gob, and not on the face of the work. After opening the pit, and getting the ventilation connected between the downcast and the upcast, if it were not a fiery mine, he would breast all the coal forward, carrying the airing along the deepest level, and bringing it back along the upper level, working straight before him. If it were a very fiery vein, he should recommend driving out the galleries to the extremity, and sinking backward instead of forward, so that the gas would be left behind, and the ventilation maintained by having the galleries in solid coal, and not subject to leakage through the gob. He would take the breast of coal forward and leave the gob behind. Mr. Dickinson then explained the mode of working which he would recommend; it is not new to experienced coal mining engineers, nor, indeed, to many working miners, but we have been thus minute in our epitome of it, as it comes from a government inspector, to whose care a very extensive mining district is confided, and as it may be supposed to bear with it the stamp and weight of official authority.

PURIFYING APPARATUS OF M. BÉRARD FOR SEPARATING FROM COAL ANY FOREIGN SUBSTANCES WHICH IT MAY CONTAIN, SUCH AS PYRITES OR SCHIST.*

The washing of coal, a system introduced into France, within the last three or four years, is a branch of industry of the highest importance, permitting the use of coal, which, by its mixture with schist, would not be otherwise employed. It may also be employed with advantage to certain coals, considered to be of good quality, but containing a quantity of ash, which diminishes the value. They are purified by this method in such a way as to allow of the manufacture of a coke from these coals, not containing more than three or four per cent. of ash. The Great Northern Railway of France has recognized the efficiency of this method, and a considerable part of the coke which it consumes is manufactured of washed coal; there result from its employment a marked economy of fuel, and a greater durability of the locomotives.

The expenses of washing, which are considerable by the ordinary method, are reduced to ten or twelve centimes (about a penny) per metrical ton† of fuel, by M. Bérard's method. A very important desideratum may, therefore, be considered as obtained.

The apparatus consists of three parts, viz:

1. An *elevator*, formed of an endless chain with buckets, which lifts from a trough or pit where the coals are placed a certain quantity, regulated by means of a valve.

2. A *separator*, into which the fuel is thrown by the elevator. This is composed of a long box, divided into compartments, and containing perforated plates, in stages, the size of the perforations being smaller and smaller, by stages, from the upper to the lower, so that by the shaking which this box undergoes, the coal is divided at once into four sizes. The finest powder falls to the bottom, and each of the three sizes of lumps being thrown out through openings in the sides of the box, into separate fixed sieves, called "bancs à lavage," which form the third part of the apparatus.

3. These "bancs à lavage" are long frames, measuring 9 feet 2 inches by 4

* From the Reports of the Juries of the Exhibition of the Works of Industry of all Nations, 1851. London.

† The metrical ton is equal to 1000 kilogrammes, or nearly an English ton, and contains 10 metrical quintals.— I. W.

feet, of which the bottoms are pierced with holes, the diameter of which is smaller than that of the pieces of coal thrown into them. They are entirely filled with water, and divided in the interior into three parts. In one of these is a piston, which is worked up and down, and gives considerable motion to the water, which being communicated to the materials thrown on the bottom of the tank, these arrange themselves rapidly, in the order of their density, the heaviest being at the bottom. The pure coal alone comes to the surface, and, by a current of water proceeding from a trough above, it is carried beyond the tank, and falls directly into the wagon, whence it is conveyed to its destination. The substances heavier than coal, such as schist or pyrites, are deposited on the perforated bottom of the tank, which has a slight inclination towards a trap, and thus constantly advance towards an exit. By a peculiar arrangement, the rubbish is thus made to carry itself into a compartment prepared inside of the tank, whence it is removed by the mere opening of a valve.

It will be seen from this description, that the work is continuous throughout, and requires no manual assistance. According to the declaration of M. Bérard, the quantity of coal that can be cleaned in an hour by a machine, the total cost of which would be 10,000 francs (£400), is ten to twelve metrical tons. The working of such a machine would not require more than 2000 gallons of water per day (8 to 10 cubic metres).

The various specimens exhibited are as follows:

1. Coals classed in four sizes, and the foreign matters that have been separated from them.

2. Two specimens of coke; one made from coal as it comes from the mine, and the other from "washed coal." The first contains 26 per cent. of ash, the second only 2¼ per cent.

3. A drawing of the apparatus.

The specimens are from an establishment founded by M. Bérard, at Molenbeck St. Jean, near Brussels.

M. Bérard states that his apparatus has been adopted by the mining companies of the Loire, Creuzot, Epinac, &c., in France, and that at the present time there is one being erected at Newcastle.

ORIGIN OF COAL.

Coal is without doubt wholly of vegetable origin; hundreds of species of plants have been distinguished in the coal formation, but none of these have been found living on the earth, although many of the families still exist. The recent allied species are generally of a diminutive size, in comparison with those of the coal period, and those that approach the ancient in magnitude, are chiefly found in tropical climates.

Duly informed in geology, we should never look for coal in granite, nor among the most ancient rocks; and in the wide intervening series, a large part of the formation are excluded from the association with this most important mineral. Slates, shales, and limestones, charged with bitumen, afford indications of some value, but not decisive, as bitumen is associated with many minerals that do not belong to the coal formations. The impressions of plants in the rocks, especially those charged with bitumen, strengthen the presumption, and should we find fragments of coal scattered in the soil, or mingled with gravel or sand in the banks and water courses; or observe dark masses of earth, which, on close inspection, appear to contain fine coaly matter, we may infer that beds of this combustible may be near, and that it may be proper to dig or bore; and when at last we find the beds of coal, they will be regularly arranged between a roof and floor of coal slate or shale.

But it by no means follows, that beds of shale and slate, necessarily indicate coal; those of the primary series would scarcely contain any combustible, unless it were plumbago, or possibly a little anthracite.

The geological laws of coal are very strict, and a thorough acquaintance with them is the only safeguard against fruitless enterprises.—*Professor Silliman, in Mantell's Wonders of Geology.*

TABLE OF THE PRINCIPAL COAL-FIELDS OF THE BRITISH ISLANDS.

	Estimated workable Area in Acres.	Number of workable Seams.	Estimated Total Thickness of workable Coal in feet.	Thickest Bed in feet.	Total thickness of Coal-bearing Measures in feet.
1. Northumberland & Durham District:					
Newcastle coal-field	500,000	18	80	7	
2. Cumberland and Westmoreland and West Riding of Yorkshire:—					
Whitehaven and Akerton	80,000	7	....	8	2,000
Appleby (three basins)	17,000				
Sebergham (Cumberland)	....	1	8	8	
Kirby Lonsdale	2,500	4	17	9	
3. Lancashire, Flintshire, and North Staffordshire:—					
Lancashire coal-field	380,000	75	150	10	6,000
Flintshire	120,000	5	39	9	200
Pottery, North Staffordshire	40,000	24	28	10	
Cheadle	10,000				
4. Yorkshire, Nottinghamshire, Derbyshire, &c.:—					
Great Yorkshire coal-field	650,000	12	82	10	
Darley Moor, Derbyshire / Shirley Moor	1,500				
5. Shropshire and Worcestershire:—					
Coalbrook Dale, Shropshire	12,000	17	40		
Shrewsbury	16,000	3			
Brown, Clee Hill	1,300	8			
Titterstone, Clee Hill	5,004				
Lukey Hill, Worcestershire	650				
Bewdley	45,000				
6. South Staffordshire:—					
Dudley and Wolverhampton	65,000	11	67	40	1,000
7. Warwickshire and Leicestershire:—					
Nuneaton	40,000	9	30	15	
Ashby-de-la-Zouch	40,000	5	38	21	
8. Somersetshire and Gloucestershire:					
Bristol	130,000	50	90		
Forest of Dean	36,000	17	37		
Newcut, Gloucestershire	1,500	4	15	7	
9. South Welsh coal-field	600,000	30	100	9	12,000
10. Scottish coal-fields:—					
Clyde Valley / Lanarkshire / South of Scotland, several areas	1,000,000	84	200	18	6,000
Mid Lothian	....	24	94	..	4,400
East Lothian	....	60	180	18	6,000
Kilmarnock / Ayrshire	....	8	40	30	
Fifeshire	....	..	....	21	
Dumfries coal region	45,000	10	55	6	
11. Irish coal-fields:—					
Ulster	500,000	9	40	6	
Connaught	200,000				
Leinster, Kilkenny	150,000	8	23		
Munster (several)	1,000,000				

IRON AND ZINC.

LAKE SUPERIOR IRON

THE following is a report of an analysis of iron ore found in the neighborhood of Jackson Mountain, about twelve miles south of Lake Superior, and forty-five north of the head of the Bay de Noquet of Lake Michigan. Jackson Mountain is regarded as the centre of the iron district, and is in part owned by the Sharon Iron Company, whose works are located in Pennsylvania. The specimens of which the analysis was made, were discovered by Mr. Philip Thurber, an experienced iron manufacturer, after the following manner:—

About two miles from Lake Superior, near the line of plank road built by the Sharon Company, Mr. Thurber's attention was attracted by the color of some rocks which a man, who was building a saw-mill, had thrown out, and upon examing them, they were found to be a quality of iron ore superior to any found in any quantity elsewhere in the United States. After securing "the location," Mr. T. proceeded, with specimens of the ore, and iron made from it, to New-York, to have them examined. Professor HENRY WURTS made an examination and analysis of them, and gives the following testimonial to Mr. Thurber:—

The samples of iron ore and malleable iron submitted by you, have been subjected by me to a complete and accurate examination, and the following results obtained:—

Composition of the ore in 100 parts:—

Peroxide of iron (mean of two determinations)	71.86
Alumina	0.50
Silica	22.52
Lime	0.05
Magnesia	0.10
Water	2.36
Muriatic acid	1.36
Oxide of nickel (not determined)	
Phosphorus, a faint trace, just detectable by the most refined method, but too small to be weighed.	

Sulphur and manganese were searched for with great care, but could not be found. The above quantity of peroxide of iron corresponds to a little more than 50 per cent. of metallic iron. Such ore as the above, so free from sulphur, phosphorus, &c., should make an iron of the most superior quality; but at the same time a considerable quantity of slag must inevitably be found, owing to the amount of silica which is present; and I would recommend, therefore, the addition of limestone to the ore when it is smelted, for the purpose of assisting in the formation of this slag, and preventing it from taking up too much of the iron. It will be necessary, however, as a matter of course, to select a limestone which is perfectly free from sulphur, phosphorus, and other substances, which would injure the quality of the iron.

Examination of the iron:—A cubical piece of the iron was filed out of the centre of the mass and heated red hot, to destroy the state of compression produced by the hammering to which it had been subjected. After cooling, it was cleaned with diluted acid, and its specific gravity accurately determined. This determination gave 7.804. The true specific gravity is, however, undoubtedly somewhat greater than this, because microscopic examination showed that the iron contained minute flaws, and particles of charcoal, which reduced its specific gravity, and which are due of course, merely to the imperfect working to which it has been subjected. The specific gravity of ordinary malleable iron is, according to Brisson, 7.788, and that of the present commercial malleable iron, according to Kaesten, the highest living authority on the subject of iron, but

7.79; so that your iron is one of high specific gravity; which is explained by the result of its qualitative analysis, which indicated, besides traces of carbon and silicon, which must necessarily exist in all iron manufactured by the Gatalan process, the presence of a very appreciable quantity of nickel. The presence of this nickel not only explains perfectly its high specific gravity, but also its capability of taking a high silver-like polish. In fact, the iron which I have examined for you, appears to be almost, if not quite, identical with an alloy obtained once by Professor Faraday and another chemist, by adding three per cent. of nickel to commercial iron, which alloy they described as being as tough as the iron itself, but at the same time whiter, heavier, and rusting less easily.

I regret that time does not permit me to make a quantative analysis of your iron, so as to ascertain the quantity of nickel contained in it. It may amount to two or three per cent. The property of taking a white polish will render your iron preferable for making gun barrels, and many other articles for which tough iron, susceptible of a good polish, is desirable.

In conclusion, I will give the opinion that if you have a workable and abundant deposit of such ore, as I have analyzed for you, at your locality, it undoubtedly may be made of great value."

THE FOREST CITY IRON WORKS.

The manufacture of iron is rapidly becoming a very extensive branch of business in the city of Cleveland, Ohio—very full details of it may be found in the *American Railroad Journal*, to which we are indebted for the annexed facts relating to the Forest City Iron Works:—

The Forest City Iron Works, controlled chiefly by Messrs. Hayes, Moore, McLelland, Renton, and others, will immediately commence the erection of their works on the Lake shore, about one mile east of the dock in Cleveland. They have secured eight acres of ground, a space ample for the most extensive operations, upon which they will commence during the present week, a large smelting and refining works and rolling mill, the former to employ twelve of James Renton's improved ore-welding furnaces, capable of turning out upwards of 500 tons of blooms per month. The furnaces and other improvements employed, will, it is anticipated, effect a large saving in the cost of manufacture over that by the ordinary process. It is believed that bar iron can be produced at a cost of $28 per ton, allowing $8 for mining and shipping ore to Cleveland, $10 for working into blooms, and $10 for conversion into the marketable article. This cost has been estimated, with the use of the improved furnaces, as low as $22 a ton, but $28 is believed to be a liberal allowance, capable of covering all contingencies. The raw ores will be furnished under a contract with parties owning ore lands in the Lake region. The ores secured by this contract are expected to yield 70 per cent. of iron, and it is this degree of purity, and consequently small amount of waste, that will allow of shipping these ores with profit, in their raw state, from Superior to Cleveland, and thereby dispensing with the necessity of investments at the Lake. The location of these ores is on Carp river. The coal used at the Cleveland works will be a bituminous coal, dug upon the line of the Cleveland and Pittsburgh Railroad, 69 miles from Cleveland, and will be delivered in Cleveland at a cost of $1 70, per ton.

The iron, which can be placed on board of any of the cars running out of Cleveland, for less than $30 per ton, would be superior for engines, boilers, rails, job work, and other purposes, to the iron for which 5¼ cents per pound is now paid. The *blooms* made from Lake Superior ore, which Mr. Hayes of Cleveland estimates can be made for $28 a ton, have been sold already in Cleveland for $65 a ton, in lots of 100 tons, and have received offers in Pittsburgh of $75 a ton. These were just as they were delivered from the Lake, where, from the imperfect character of the works, the ore was not thoroughly

worked, and was not as valuable as it will be made when the contemplated improvements are completed. Already has Eastern capital been attracted here; but in view of the immense advantages likely to result from its investment, we may say that not the *one-hundredth part* which should be sent here has been yet subscribed or expended for works of this character.

IRON ORE IN WISCONSIN.

Picking up a few of the cinders, we drove to Iron Ridge, and commenced our explorations. The top of the ridge is covered with heavy masses of limestone, arranged irregularly, although for the most part in square blocks. There is hereabouts a large cave, unexplored, and its existence known to but few. Its mouth is barely wide enough to permit a man to creep in. One of the engineers of the La Crosse and Milwaukie Railroad informed us, that he went in a short distance, and that it seemed to widen as he advanced. The top and sides are dripping with stalactite, tinged with a reddish cast by the iron ore, some specimens of which we can show to any one curious in such matters.

We found a large gang of men under the employ of the new Iron Company, engaged in drifting and sinking shafts. The ridge is covered with a colored soil, a few inches in depth, but sufficient to sustain the growth of large trees. Immediately under the soil we meet with the ore, which at the bottom of the ridge lies about four feet deep, but increases in depth as we ascend. And, again, under the ore is the hard blue clay.

A company has been lately formed, with a capital stock of $500,000, for the purpose of erecting extensive iron-works, and melting and manufacturing the ore. The location of their mills is directly over the ore-bed. and the expense of getting the ore into the furnace will be merely nominal. The work will be energetically carried on, as may be judged from the fact, that the company has contracted with the La Crosse and Milwaukie Railroad Company to deliver them fifty tons of railroad iron per day after the first of March next, until the track is laid to Portage city.

The improved method of smelting will contribute largely to the success of the enterprise. The *wrought*-iron will be made directly from the ore, at one process, thereby avoiding the additional expense of fuel and labor incurred by the old method in turning out the pig-iron, and afterwards melting *that* to procure the *wrought*. The construction of the La Crosse Railroad affords a market and transportation for their iron. The quality of the iron has been tested, and found very superior.

COST OF BRITISH PIG-IRON.

The cost of making hot blast pig-iron per ton in the principal smelting districts, is estimated as follows:—

Staffordshire, ...	48s to 58s,	equal to	$10.56 to $12.76
South Wales, ...	48s to 58,	"	10.56 to 12.76
Scotland, ...	38s	"	8.58

Whether there is any material difference in the qualities of these irons is not stated, nor are we informed if the estimated average of expenses of repairs and interest are included.

GALVANIZED IRON.

Perhaps the largest contracts are now in course of execution by Messrs. Morewood and Rogers of London, who have recently opened extensive works at Birmingham. They have nearly completed an order for no less than 300,000 tons of their galvanized wire, which, when laid out, will measure 600,000 miles, and is being completed for the Honorable East India Company. This order, exclusive of other important contracts engages the attention of all hands in this

establishment; and here I may, perhaps, observe that the galvanizing process is now being employed to almost all descriptions of cast and wrought iron work which it is desirable to protect from rust. At the same manufactory, upwards of 10 tons of iron flower labels, thus protected from decay, have just been prepared for the Botanical Gardens of Sydney, besides a large quantity of galvanized iron for the roofs of some of the principal buildings in the colony.

PENNSLVANIA AND LEHIGH ZINC COMPANY.

The works of this company have recently been completed and commenced successful operations. Some new processes in the manufacture of zinc have, it is said, been introduced, which are not yet publicly made known. The full particulars respecting the first operations at the works are introduced in the columns of the "New-York Daily Tribune" with these remarks:—

"We annex a letter from a highly intelligent gentleman, who was one of the party who visited the works of the Pennsylvania and Lehigh Zinc Company on Tuesday, and witnessed the very successful experiments there made. The writer is evidently highly delighted with the results:"

There is, perhaps, no more interesting improvement in the arts than the process of producing that beautiful white pigment, oxide of zinc, from zinc ores by sublimation or distillation. This art was first discovered in France by the celebrated Le Clair, who was knighted for his discovery. Le Clair first reduced the ore to spelter, or its metallic form, and then burned the zinc, and sublimed the oxide in fire-clay tubes. This process, somewhat modified, is pursued to the present day by the Veille Montaigne Company, whose mines are situated in France and Belgium.

The process of the manufacture of white oxide has been greatly improved in this country, principally by Samuel Wetherell, Esq., an ingenious practical chemist and metallurgist, who has had a large experience in the manufacture of white lead pigment in the manufactory of the Belleville White Lead Company of Philadelphia, in whose laboratory he gained that practical knowledge of the art of manufacturing pigment of lead, and of chemistry in general, which, in after years, contributed materially to the improvement of the manufacture of white oxide of zinc. Mr. Wetherell is the inventor of an improved process of manufacturing the white oxide of zinc directly from the ore, without the long and expensive process of first reducing the ore to a metal before distillation, and without the use of fire-clay tubes. The invention of this process belongs to Mr. Wetherell, and is wholly distinct and different from that of any other process hitherto pursued. A great saving of time and expense is obtained, besides a superier quality of oxide being produced, which is completely freed from coal dust, particles of metallic, or non-oxidized zinc or sulphur. This process is at once complete, economical, and successful, and entirely sets at defiance all competition in the manufacture of zinc paint. Measures have been taken by Mr. Wetherell to secure his invention by Letters Patent. These, he certainly deserves, and may rightfully claim for the novelty and usefulness of his method.

We are permitted to say that the works are divided into three separate and new inventions combined together, making a perfect whole. First, the *furnaces*, where the ore is oxidized directly by the application of heat and blast within the ore; second, the *separator*, a new and ingenious method of separating the small particles of carbon from the perfect oxide; third, the catching apparatus, which is large, and adapted to the work to be accomplished. One portion of the process, where the carbonic acid, and other gases are separated from the oxide of zinc, together with the flux used in the process, Mr. Wetherel very properly keeps secret until the proper time arrives, when it can be offered to the public without injury to the inventor.

It has been broadly asserted that zinc white could not be made without in-

fringements upon patents already granted by the United States Government. We have been allowed to examine the process of Mr. Wetherell, and being familiar with the processes followed both here and in Europe, take much pleasure in stating that the process is different from any ever before attempted—is perfectly simple, and entirely successful in all its parts.

The ore of the Pennsylvania and Lehigh Zinc Company is of the same class as that of the Belgium mines, but yields a larger percentage of zinc upon its reduction in a large way. It will average 40 per cent., although some pure specimens have been found to yield as large as 80 per cent.

The assertion that the oxide of zinc could not be made from the electric calamine, unless by first reducing the zinc to a metallic state, and then subliming it, has been proven within the present week to be untrue. This fact is not the result of a mere analytical experiment in the laboratory, but is daily accomplished, making four tons of oxide of zinc, or twenty-four tons per week. We learn from an officer of the company, that the company will immediately proceed to enlarge their works and increase the product to ten tons per day, or 3000 tons per annum of No. 1 dry white oxide, worth 6½ cents per pound, or $130 per ton, amounting to $390,000, which, if ground in oil, would be worth 9 cents per pound, or $180 per ton, amounting to $540,000 per annum. Supposing the proportion of 500 tons were to be sold in a dry state, and 2500 tons sold ground in oil, a gross profit of $250,000 per annum would be realized. These estimates may be relied upon as demonstrated by the actual working of the manufactory.

It must be borne in mind, that the above results are obtained from an ore that has hitherto been considered as nearly valueless in this country, but which will hereafter take its place in the first rank of zinc ore, not only from the large percentage of oxides and metal which these ores will yield, but from the comparative cheapness with which it may be mined and crushed, ready for the furnaces, and also its freedom from iron ore, manganese, sulphur, or other mineral whose oxidation would affect the brilliant white oxide so desirable to produce.

The white oxide produced by the new process will compare favorably with the best French white, besides being superior to it in opacity or body. It combines readily with oil, without toughness or ropiness. Three qualities will be produced: No. 1, equal to the French of this grade; No. 2, ditto, and No. 3, a gray oxide for the painting of the outside of buildings, metal work, ship bottoms, &c., being superior to the French of this grade, all of them possessing a body equal to the best English white lead.

The works of the company are most pleasantly and favorably situated in respect to cheapness of fuel and transportation of the articles manufactured to market, being upon the south side of the Lehigh river, in a charming valley of the same name, directly opposite to the old Moravian town of Bethlehem. The Lehigh canal runs within a few hundred feet of the manufactory, affording a water communication to the Mauch Chunk Coal Mines, which are but 28 miles distant, affording coal at a cost of $5.50 per ton delivered. The canal also furnishes a water communication to Philadelphia and New-York by the Morris and Essex canal. From Easton, Pa., 12 miles distant, there is also a railroad communication direct to New-York and Philadelphia; and another road called the Lehigh and Mauch Chunk Railroad is located to run directly in front of the works, having a depot not 100 yards distant, which road is contracted for, to be completed one year from the first day of October last. This road, when finished, will afford coal for $1.75 cents per ton, and afford a direct railroad communication to market.

The manufactories of the company have been constructed of brick, in the most thorough and permanent manner, and were erected in a remarkably short period of time, under great disadvantages of weather; they were commenced on the 13th of April last, and were nearly finished on the 9th of July, when a tornado swept through the valley, demolishing every thing in its course, and

levelling the main building, which was 40 feet by 80, and had been completed with the exception of the roof. Since that time the works have again been constructed in the same thorough manner as previously.

The furnaces were fired up for the first time on Saturday, Sept. 11th, and have been kept burning for the purpose of drying the brick, and on the 20th they were run for a short period for the purpose of making oxide of zinc, and the result was highly satisfactory, demonstrating the estimates of yield that have been given above.

An article of white paint was produced that would compare favorably with the zinc of the Vieille Montaigne manufactory. As a result of the twenty furnaces, which are now in full blast, we deem it safe to say that at least four tons of pure white oxide, of No. 1 quality, will be produced per day as a steady yield, besides 10 per cent. of gray oxide. (Of the superiority of zinc ore to white lead, as a cheap, beautiful, and healthy paint, we deem it needless to allude.)

The mines of the company are situated but a short distance from the manufactory. The company have now in active operation four engine shafts. The shafts are 6 feet by 9, and 8 feet by 12. In the deepest one of these shafts the zinc has been cross cut to the width of 30 feet north and south, and 60 feet on the course of the zinc east and west.

This shaft is now producing a supply of ore daily equal to the present wants of the manufactory at Bethlehem, and we risk nothing in saying that the supply can be increased from this shaft to an amount equal to 70 tons of washed ore per day, which will yield on the average 40 per cent. of oxide of zinc.

Two of the shafts now sinking are at some distance from the *deep shaft*, and are being put down as rapidly as possible, with a view of getting them in the same position for drifting with the other shafts. The largest shaft, 8 by 12, is being put down with a view of making it the main engine shaft, which will drain all the working shafts, and by levels secure proper ventilation. There is now mined and raised to the surface 3000 tons of ore.

In the same quarter we find the following additional particulars from the superintendents of the works:

THOMAS ANDREWS, Esq., President Pennsylvania and Lehigh Zinc Co.:

Dear Sir,—We have a large amount of oxide accumulated in the receiving house, which will be cleared out to-morrow, the product of one week's running of 20 furnaces, and which we shall forward next week. We expect to keep up a weekly supply of 24 tons, (240 bbls.,) without interruption, until the extension of the works is completed, which we are happy to inform you is advancing at a rapid rate. Our product will then be 60 tons per week, and the quality will surpass any zinc paint in the market, both for purity and body.

We are forwarding a sample of our paint to the Franklin Institute, Philadelphia. The Society at Easton for the Encouragement of Domestic Manufactures, last week awarded us a premium. With respect,

Remain your humble servants,

GILBERT & WETHERILL.

ZINC WORKS, BETHLEHEM, PA., Oct. 15, 1853.

IMPROVEMENTS IN THE MANUFACTURE OF IRON.—[*Patented by J. S. Prideaux, of Middlesex.*]

Claims.—1. Distilling coal in suitable retorts, as in the manufacture of gas for the purposes of illumination, and conveying the products to reverberatory furnaces employed in the manufacture of iron, and burning the same with atmospheric air, using suitable storing vessels, as explained.

2. Preparing coke, used in the manufacture of iron, by employing limewater mixed with common salt, or carbonate of soda, instead of simple water, in the process of cooling the heated coke.

IMPROVEMENTS IN THE MANUFACTURE OF MALLEABLE IRON AND OTHER METALS.—[*Patented by W. Darling, Glasgow.*]

Claims.—1. A certain described arrangement of machinery.

2. A mode of working or driving iron rolling apparatus, wherein the actuating steam engine or prime mover works at a higher rate than the rolls.

3. The application and use of speed reducing gearing only between the engine and the rolls of metal-working machinery.

4. A certain mode of arranging the puddling or other furnaces employed in the manufacture of iron and malleable metals semicircularly, or in such manner that the whole of them may be at a uniform distance from the chimney, or nearly so.

5. The application and use of the puddling or other furnace flue-heat, for the generation of steam, as described.

6. The application and use of mechanically-worked flue-bars for puddling or other furnaces.

IMPROVEMENTS IN THE MANUFACTURE OF WIRE.—[*Patented by J. D. M. Sterling, Birmingham.*

This invention has for its object the manufacture of wire from zinc, and its ductile alloys coated with silver and suitable alloys. This is effected by causing the zinc or its alloys to be first coated on all sides, and then drawn into a wire, or by applying the coating during the time, or between the times of drawing the wires. When silver is to be the coating metal, a convenient mode of proceeding is to coat the zinc on all sides with silver by pressure, or to fill a tube of silver with zinc or its ductile alloy, and then to draw the same into wire.

IMPROVEMENTS IN FURNACES AND APPARATUS COMBINED THEREWITH FOR MAKING IRON DIRECTLY FROM THE ORE, &c.—[*Patented by A. E. L. Bellfont, London.*

The principal feature of this invention will be seen from the following claim, viz., deoxydizing the ore in a chamber which is so constructed and arranged as to be heated by the waste heat from a puddling reverberatory or other furnace, and at the same time to prevent the gases and products of combustion from coming in contact with the ore, except during the time of charging; and which likewise permits the charge of deoxydized ore to ascend upon the puddling or preparatory hearth or bottom, without exposure to the atmospheric air. The patentee also describes and claims several less important arrangements.

IMPROVED MODE OF HEATING AIR FOR BLAST FURNACES.

Mr. Charles Sheppard of the Maesteg Iron Works, Wales, has patented an improved apparatus for heating air for the blast in iron manufacture. By the ordinary mode the air is passed through single pipes, heated on the exterior only; by the new plan the air traverses the annular spaces between two or more pipes, heated both on the exterior and in the interior. A space of two inches is left between the pipes, and to increase the heating surface, a spiral flange or rib may be cast on the exterior of the inner pipe. By these arrangements a large saving is effected in the fuel required for heating the air, a more powerful and uniform heat obtained, the first cost of construction reduced, and the expense of repairs rendered of less amount than usual. The heating pipes are placed vertically in a row, or two rows, and the alternate ones of each communicate with the blast pipe of the blowing engine, by which the cold air passes to the annular spaces between the tubes.

THE ST. GEORGE'S IRON MINES, SAVOY.

In the course of my professional travels in the south, I was induced to visit the iron mines called St. George's d'Hurtieres, situated in the Maurienne Savoy, near the top of a high range of mountains, forming part of the extensive chain which separates the valley of the Arc from that of the Isere, and I think some account of them may prove interesting, especially as the English are said to have worked them ages ago, and to have given them the name of St. George. These mines lie to the east of Chambery, and between 20 and 30 miles distant from it; they occupy a considerable space, and consist of upwards of sixty different galleries.

The ore consists of an argillaceous carbonate of iron, embedded in stratified layers of micaceous schist, dipping from 30° to 40° towards the south. The mineral is disseminated throughout the mass in small shining scales, of a yellowish-gray color, which become brown on exposure to the atmosphere, and yield on an average from 33 to 35 per cent. of pure metal. The ore is also found embedded in a matrix of quartz, which runs in veins or extensive layers through the interior of the mountain, and which the miners of the locality call marble; these strata are extremely irregular, and follow almost every conceivable direction.

Copper ore is likewise found here in veins or nodules, deposited upon the argillaceous carbonate of iron, and contained in a matrix of quartz. It is found in greatest abundance near the upper part of the mountain, and generally seems to follow the line of its external *contour*. This ore yields 10 per cent. of pure copper. Galena, or lead glance, and zinc are also found in these mines, especially the former, which usually contains 1-500th part of silver, and 70 per cent. of lead.

The different analyses of specimens of the iron ore obtained from one or other of these mines give as follows:—

No. 1.—Protoxide of iron, 50.50; ditto of manganese, 8.00; lime, 1.70; magnesia, 70; quartz, earth, &c., 1.00; carbonic acid, 38.10 = 100.00.

No. 2.—Carbonate of iron, 81.00; ditto of manganese, 18.00; ditto of lime, 3.50; quartz, clay, &c., 1.00; magnesia (carbonate of), 1.50 = 100.00.

No. 3.—Metallic iron, 57.30; ditto maganese, 1.56; lime, 1.00; silex, 16.70; oxygen and loss, 23.44 = 100.00.

This mountain is peculiarly remarkable for the quantity of ore which it contains, and the facility with which it is obtained. As soon as the miners come upon the quartz, they are certain in following it to find either iron, copper, or lead; and so inexhaustible is the quantity of iron contained in these mines, that a barrister, some little time ago, pleading against one of the proprietors who wished to assume a right over all the iron, because he had purchased some of the veins of copper, argued that as there was a clause in the contract providing for the possible contingency of the ore running out, he could not by such an instrument have had conveyed to him any property in the iron ore, which no one ever thought of seeing exhausted in any lapse of time—the argument was considered conclusive.

These mines, it would appear, are the most important in Savoy, employing during the winter several hundred hands, and in summer as many as can spare time from cultivating their fields; and they more than suffice to supply the foundries of Epierre, Randers, St. Helene de Milliere, Bellevaux, Aillon, St. Giez, Hugon, &c., besides exporting a large quantity of ore to France. The country people who work the mines adopt no regular system; they proceed without compass, and often without plan, following the vein containing the metal up or down, to the right or left, and proceed as far as they can, until they come in upon the operations of some other proprietor, who is likewise anxious to extend the limits of his mine as far as possible. These mines are transmitted from father to son from the most remote generations; they were worked in the time of the Saracens, and before the introduction of powder. The rock was then blasted by allowing quick-lime to ferment in cavities hol-

lowed, out in it for that purpose, and the remains of scoriæ, now forming part of the mountain, embedded beneath the vegetation and the thick soil, which must have taken a long time to accumulate, is looked upon as evidence of the extreme antiquity of these works. These mines are occasionally sold as real property, and are considered a very valuable investment.

The manner of extracting the ore is as follows:—Holes are bored 10, 20, or 30 inches into the solid substance of the rock, as the case may be, by means of long chisels; in these a sufficient charge of powder is placed, and a certain quantity of the quartz containing the ore thus detached from the mountains in blocks; after which it is reduced to smaller pieces, 3 or 4 inches in diameter, by means of heavy hammers, and then placed in heaps ready to be roasted. The operation of boring is performed by day laborers, who are subjected to a species of task-work, inasmuch as the amount of labor expected from them per diem is estimated at the rate of 30 inches, for which they receive 30 sous, or ½d. per inch; if they bore more than this, they are allowed payment at the same rate, and they frequently make, by working night and day, wages to the amount of nine days, or even more, per week, and as they are paid once a month, they sometimes receive between £2 and £3 at a time.

When the ore has been extracted from the mine, it is put into kilns formed in the shape of inverted cones, which are either sunk in the earth, and faced with dry rubble work, excavated in the rock, or built on the surface of the ground with loose stones, placed one upon the other, without mortar or cement. The broken stone containing the iron is piled up in these kilns, with firewood arranged in successive alternate layers, each about 2 feet in thickness. When the kiln is thus filled, it is then covered over with the ironstone, pounded to a very fine powder, and put on as a lute, being mixed with water; the whole mass is then fired, and left to burn for a week. In some kilns the roasted ore is extracted through an opening below, while the upper part of the kiln is replenished with a succession of fresh materials; but in the generality of works the fires are extinguished, and the residue left to cool for a fortnight before any part of it is removed.

The next operation is that of separating the quartz and dross from the resulting ore, and this is done by workmen, who select only the best specimens, and break them into very small fragments, of about an inch in diameter. The ore, thus prepared, is then carried down in sacks to the base of the mountain, on little trucks or drays, drawn by mules; it is then emptied out into small compartments, divided off at the side of the public road, and separated one from the other by small dwarf walls, so that each proprietor deposits the proceeds of his mine in the little *entrepôt* which he owns, whence it is afterwards deposited in the foundry for which it is destined. Twelve measures of iron ore, called *bennes*, when delivered at the foundry, is paid for at the rate of 6s. This quantity yields about 4 cwt. of cast-iron, of the finest grain, and a beautiful white color. The pigs of cast-steel are in great request in France and other countries, where they are found admirably adapted for cutlery, &c., and bring from 4*l.* to 8*l.* per ton.

De Saussure, in his *Journey over the Alps*, says that some of this iron is founded in the neighborhood of Renders, in a large furnace, and requires no other flux than the scoriæ of the preceding castings. The foundry in question he says, consumes 60 charges of charcoal per day, each containing 28 cubic feet.

This furnace yielded per day, when he visited it, 8¼ tons of metal, which usually sold for		£18 0 0
The expense per day—For charcoal, was, according to him,	9*l.*	11 0 0
For ore, ...	2*l.*	
Remains, ...		£7 0 0

Out of this 7*l.* profit, he says, must be deducted the wages of men, wear and tear of furnace and instruments, the dues on iron payable to the lord of

the manor, &c.; but still there would remain a considerable profit if the work went on the whole year round; but it is often stopped, especially in winter, owing to the want of ore, charcoal, water, and various other causes; still, the proprietor made a good thing of it then, and will make a much better now.—W. H. V. SANKEY, C.E., *Turin, July* 15.

QUARRIES AND CLAYS.

COMPOSITION OF THE EARTHY MIXTURES OF ENGLISH STONEWARE.

THE basis of the English stoneware is a bluish clay, brought from Dorsetshire and Devonshire, which lies at the depth of from 25 to 30 feet beneath the surface. It is composed of about 24 parts of alumina, and 76 of silica, with some other ingredients in very small proportions. This clay is very refractory in high heats, a property which, joined to its whiteness when burned, renders it peculiarly valuable for pottery. It is also the basis of all the yellow biscuit ware called *cream color*, and in general of what is called the *printing body;* as also for the semi-vitrified porcelain of Wedgewood's invention, and of the tender porcelain.

The constituents of the stoneware are, that clay, the powder of calcined flints, and of the decomposed felspar called Cornish stone. The proportions are varied by the different manufacturers. The following are those generally adopted in one of the principal establishments of Staffordshire:—

For *cream color*,	Silex or ground flints - - - - -	20 parts.
	Clay - - - - - - - -	100 "
	Cornish stone - - - - - - -	2 "

Composition of the Paste for receiving the Printing Body under the Glaze.

For this purpose the proportions of the flint and the felspar must be increased. The substances are mixed separately with water into the consistence of a thick cream, which weighs per pint, for the flints 32 ounces, and for the Cornish stone 28. The china clay of Cornwall is added to the same mixture of flint and felspar, when a finer pottery or porcelain is required. That clay-cream weighs 24 ounces per pint. These 24 ounces in weight are reduced to one-third of their bulk by evaporation. The pint of dry Cornish clay weighs 17 ounces, and in its first pasty state 24, as just stated. The dry flint powder weighs 14½ ounces per pint: which, when made into a cream, weighs 32 ounces. To 40 measures of Devonshire clay-cream, there are added—

13 measures of flint liquor.
12 — Cornish clay ditto.
1 — Cornish stone ditto.

The whole are well mixed by proper agitation, half dried in the *troughs* of the slip-kiln, and then subjected to the machine for cutting up the clay into junks. The above paste, when baked, is very white, hard, sonorous, and susceptible of receiving all sorts of impressions from the paper engravings. When the silica is mixed with the alumina in the above proportions, it forms a compact ware, and the impression remains fixed between the biscuit and the glaze, without communicating to either any portion of the tint of the metallic color employed in the engraver's press. The felspar gives strength to the biscuit, and renders it sonorous after being baked; while the china clay has the double advantage of imparting an agreeable whiteness and great closeness of grain.

Dead silver on porcelain is much more easily affected by fuliginous vapors than burnished. It may, however, by the following process be completely protected. The silver must be dissolved in very dilute acid, and slowly precipitated; and the metallic precipitate well washed. The silver is then laid (in wavy lines?) upon the porcelain before being colored, (or if colored, the color must not be any preparation of gold,) in a pasty state, and left for 24 hours,

at the expiration of which time the gold is to be laid on, and the article placed in a moderate heat. The layer of gold must be very thin, and laid on with a brush over the silver before firing it, when, by the aid of a flux and a cherry-red heat, the two metals are fixed on the porcelain.—*Newton's Journal*, xxxi. 128.

LAKE SUPERIOR MARBLE.

We saw yesterday a small slab of Lake Superior marble which had been polished, and presented a most beautiful appearance.

The color was pinkish lilac, shaded in layers and strata dark and light. with dark and light colored flakes occasioned by the remains of shells. But the most distinct feature was a series of dark purple veins which run throughout in every direction, forming delicate but distinct lines, and contrast with the light lilac of the stone most beautifully. The texture of the stone is compact, hard and firm, slightly crystalline, and promises to be a very durable building stone.

NATURAL AND ARTIFICIAL MARBLE.

King David, as it is known by the Bible, Chron., chap. xxx., used marble to build the Temple of Jerusalem. Also, the Phœnicians and Persians, according to their history, used it, and King Ahasuerus erected a castle of variegated marble at Susan.

Homer, in his Iliad, mentions its application with the Greeks, and 570 years before Christ the art of cutting and polishing it was invented by them. The Romans used imported marble, and the first statue was sculptured by the command of Lepidus, but for actual purposes it was not applied before the time of the Emperor Augustus, and in the third century (under Constantine the First), it was so largely used for house building that even common soldiers, who got rich by booty, lived in their own marble houses. Africa was the place which furnished it to the Romans.

In the middle ages the general decay of arts and sciences had its influence on architecture, but the Arabians in Spain recommenced to build palaces of marble.

The Goths used granite and sandstone, as the importation of marble from very distant countries was not at all easy and cheap. Coloring of marble, although known to the ancients, was introduced by the Italian and French artists. The painter Biomo, of Rome, invented the use of oil colors on marble.

About 1750 the Italian Martinet invented artificial marble, and the French Mantamy and Racle perfected it to a high degree, so that in the year 1760 they established a factory. In the commencement of this century it was introduced in Germany, and an effort was made to cover wood with artificial marble, but it was abandoned, as the change of heat and cold destroyed the artificial covering.

In this country the experiment of covering iron with marble has recently proved entirely successful. And the brief sketch which we have given will be interesting, as an epitome of the whole history of the use of marble in artificial structures and wares.

KNIGHT'S BORING MACHINE.

On Thursday last, we visited the operation of this machine, boring for coal on the property of the North American Coal Company, about a mile east of the Coacquenac Hotel. The auger had penetrated to the depth of 315 feet, and was then working in slate. They were sinking at the rate of 1½ inches per hour, and the president of the company, Mr. Ford, who was present, felt confident that they would reach the White Ash Mammoth Vein, at the depth

ranging from three to ten feet more, judging from the nature of the strata they have penetrated. We sincerely hope these predictions may be verified. It will greatly enhance the value of a large body of land, and render accessible one of the most valuable veins of coal in this region, at a point close to a branch of the Mill Creek Railroad, and but a short distance from the landings of the Schuylkill Navigation and the Valley Depot of the Reading Railroad Company.—*Pottsville Miner's Journal.*

Patent for a machine for boring rock, Ebenezer Talbot, Windsor, Connecticut.

Claim.—"What I claim is the method, substantially as herein described, of applying a vallet cutter or cutters, for boring or excavating tunnels and other apertures in rocks or other hard substances, by causing the said vallet cutter or cutters, or sets of vallet cutters, to cut segments of circles from the centre, or near the centre, to the periphery of the tunnel or rather excavation, with the concavity towards the machine in combination with a motion or motions around the centre of said tunnel, to cause the said cutter or cutters to act in succession in the centre surface to be cut away, substantially as described."

MISCELLANIES.

PRODUCTS OF PRUSSIAN MINES.

In Prussia, accurate statistical accounts of the production of all mines are at the command of government, and the returns are annually published. The statement of the yield of the mines in 1852 is the following:—

Minerals.	Quantities raised.	Value.	Miners.
Coals .	Tons, 3,223,533	$8,856,692	36,444
Lignite . .	1,271,163	1,533,232	7,578
Iron ores .	237,823	804,916	3,438
Zinc " . .	131,048	1,014,043	5,647
Lead " . .	14,085	637,841	3,574
Copper ores .	62,156	607,883	3,620
Cobalt " . .	283	22,836	166
Nickel " .	23	15,600	—
Arsenic " . .	723	4,111	37
Manganese ores	326	6,241	51

TIN IN NEW HAMPSHIRE.

By referring to Dr. Charles T. Jackson's "Final Report on the Geology and Mineralogy of New Hampshire," published by order of the State in 1844, at pages 80, 128, 223, and 144, particular accounts are given of the mines in the town of Jackson, Carroll county. Their location is about six miles north of the regular road from Conway to the White Mountain Notch, some sixteen miles from Conway, and but a short distance from the new stage road extending from the White Mountains, north turnpike, in Upper Bartlett, through Jackson and the Pinkham woods, to the glen and station houses, near the Atlantic and St. Lawrence, in Gorham; distance from Jackson to Glen House, 12, and to Station House, 19 miles. These mines have never yet been worked. Dr. Jackson says that they contain ore yielding 30 per cent. of pure tin, and from 30 to 40 per cent. of pure metallic arsenic, or 60 per cent. combined with iron. He reduced a quantity of the ore to its metallic state, and a piece is now deposited in the State Mineralogical Cabinet at Concord.

On Bald Face Mountain, between the rocky branch of the Sacs and Ellis rivers, in Bartlett, near the south line of the town of Jackson, is found iron ore in inexhaustible quantities, at an elevation of 1404 feet above the said rocky

branch, and about a mile distant. The slope of the mountain from the river is from 17 to 20°. Dr. Jackson says of these mines:

"One of the veins at the upper opening measures 37 feet wide from east to west, and 16 feet from north to south. The second, 200 feet lower down the hill exposes the ore maintaining the same width. The vein narrows 300 feet lower down to 10 feet in width; and 400 feet further it increases to 55 feet; 546 feet lower still, there is a small opening, or cave, 20 feet deep, where the ore narrows again."

The Doctor also gives the chemical combination of the ore, and infers, from the presence of only a very small portion of manganese, that it is suitable for the best of iron, and favors the formation of steel of a very fine grain.

HUMAN BONES IN SOLID ROCK.

To the Editors of the Zanesville Courier:

With others of our fellow-citizens, I have been highly interested in the discovery of human bones in a solid sandstone rock, of a quarry near Cusick's mill, about six miles from the city, and with the assistance of Mr. Charles Robbins and Dr. Ball have taken steps thoroughly to investigate this highly interesting subject. In the mean time permit me to make a few statements. The bones submitted to my inspection *are* the bones of an adult female, they were contained in a cavity of the *solid sandstone rock*, *perfectly close*, having no communication whatever with any fissure or crack of the rock. The cavity represents the shape of the body, invested with flesh; the leg, thigh, hip and part of the back are moulded with beautiful exactness, and would, if filled with plaster of Paris, give a mould, preserving all the graceful curves of the entire body. The body lay on its right side, the head east, towards the hill, the feet west towards Jonathan's creek, where the waters at high flood lave the base of the hill some 8 or 10 feet *below* the place of the body. The same piece of rock, containing the remains, also has the perfect mould of a pair of human hands, probably *not* those of the subject enclosed. The side of the hill (on this as well as the opposite side of Jonathan's creek), presents incontestible evidence that years ago, Jonathan's creek poured over those rocks from a superior to an inferior basin, in an impetuous cascade, which gradually cut down the soft sandstone, emptied the basin above and formed the present bed of the creek in which the same process of cutting down is still going on. The bones were found 12 or 15 feet from the outside, and perhaps 50 from the top.

In this process of cutting down, the water insinuated itself into a fissure of the rock, disintegrating the stone, and reducing it to the condition of fine sand, to the breadth of two feet. This fissure approached to within two feet of the head of the skeleton, where it is suddenly arrested by the *solid rock*, and turning off at a right angle, terminates in a mere crack. In this fissure, other bones were found, which I have not seen yet, supposed to be those of a man, a young infant, and some quadruped. The fissure is full of sand, and such as is found in every quarry.

Above the rock containing the bones, is a narrow seam, containing (about fifty feet from the place) a layer of coal three or four inches thick, which, just at the place of the bones, however, is reduced to a mere fissure, presenting no coal to view externally. The sandstone is soft, stained with iron, and contains modules of iron ore. It is laminated—the lamina running horizontally, varying from a line to many inches in thickness, formed evidently by subsidence from water. Above is slate, limestone and iron ore; in the adjacent hill, also, the coal vein is four feet thick.

I made a comparison of those bones with some of those in the Athenæum, comprising a fossil sheep, ox, and tusk of elephant. All yet contained animal matter (apparently little diminished); in all, had the phosphate of lime to a great extent, replaced by carbonate; all were penetrated by oxide of iron, and those of the human being also by *metallic* iron. In calcinating, the ele-

phant tusk lost 12 to 15 per cent.; the human bones, 24 to 31; the sheep 40 to 42; the ox, 44 to 47. The elephant tusk had evidently been subjected to destructive agencies from which the others were exempt. The owners of those bones seem to have been contemporaries of the same period, and as far as present evidence goes, the human bones appear the oldest—perhaps not less than 5000 years old—therefore not those of a child of Noah.

After a more full investigation, the public shall be put in possession of all the facts and conclusions. JOHN G. F. HOLSTON.

SINGULAR OCCURRENCE IN A MINE.

After the firing of a blast at Wheal Squire Mine, one of the miners, too anxious about the result, descended before the powder and smoke had properly cleared away. He consequently imbibed the impure air, and, although immediately drawn up by his companions, did not succeed in landing, but fell from the "kibble" the depth of 14 or 15 fathoms. The anxiety of his comrades for his safety led one to descend; but he, finding himself unable to live, called to "wind up," which was done before he had properly placed himself in the "kibble;" he, however, held on with both hands, but fell before he was able to land. The greatest consternation prevailed among the miners, no one daring to venture into such an impure atmosphere, where they believed two of their comrades to lie dead. Fortunately, the captain of the mine, Mr. R. Penberthy, had read that under similar circumstances, a life had been saved by throwing water down the shaft, and after doing so for some time, they had the pleasure of knowing, by the feeble groans of their comrades, that life was not extinct; and, although severely cut and bruised from the effects of the fall, there is every reason to hope that they will be restored to their families. One of the men states that he was conscious he was dying, but was unable to speak till the descent of the water purified the air, and caused a chill to pass over his body. The other, on being brought to the surface, was apparently lifeless, and there is no doubt, that in a very short time they would have been beyond all human aid.—*Cornwall Gazette.*

SEELY'S PATENT LIME KILN.

This is one of the striking scientific curiosities of Washington, both as to its construction and capacity to produce the very best lime. The works are situated on the corner of Virginia avenue and the canal, on the Island, and with present arrangements, cover a large space, for reception of stone and delivery of lime. The kiln is built of blue stone, or the common knet stone, and is about twenty feet square at the base, by eighteen feet, its height about sixty-two feet, the building being square, tapering from the base to the apex. Of its internal construction we are not allowed to know any thing, that being the secret of its power and ground of the patent, but of its wonderful capacity of production something may be said. It is said that the best of other kilns can only burn 400 barrels of lime in eight days. An idea of the superiority of this one is given in the fact, that it will burn 240 barrels per day, or 1,920 barrels in eight days. Besides, it consumes less wood, taking but six cords to make 400 barrels of lime, where other kilns take about 30 cords, and it burns coal, if necessary, as well as wood. The number of laborers are the same as on other kilns—about ten hands working day and night—the fire not being allowed to subside. It will burn 500 barrels of limestone per day, which is supplied by an elevator or endless chain, with buckets attached, which, by a rotary motion, drops the stone into the top of the kiln, with great facility. The fire that burns the stone generates the steam to work the elevator. There are five fireplaces twenty feet from the base. A "mechanical blower" is attached below the principal part of the invention, by which the flame is driven through the kiln, and cool air introduced to the lime as drawn, the carbonic acid being entirely separated from the material, and producing the article in a perfectly

pure white state, owing to the great draft. The elevator is worked by an eight-horse power engine, and is also to be so arranged as to bring up the stone from the canal, and deliver the lime from the kiln. The patentee has built no other, therefore this is the only one of the kind in existence, and is acknowledged by lime burners from Baltimore county, mechanics, and others conversant with such matters, to be superior to any kiln yet invented. Mr. Samuel J. Seeley, of New-York, is the inventor, and the proprietors are Messrs. Seeley, Boyle & Co., who supply the lime for the Capitol extension (as well as other places), where the article may be seen. This is, probably, an imperfect description of the concern, but it is as correct as we can make it, under present circumstances, and will answer our purpose, which is to attract the attention of the scientific and curious in mechanical and manufacturing matters, to one of the great inventions of this inventive age.—*Washington Star.*

BAKER'S IMPROVED STEAM BOILER FURNACE.

This is an invention designed to increase the efficiency of fuel in generating steam. It has been in use several years, and has uniformly, as we learn, given highly satisfactory results.

Though extremely simple in its construction, it is somewhat difficult to give a verbal description, which will be easily understood. By means of a diagram it may be comprehended at a glance. The ash pit, fire grate, and fire bridge are in this furnace constructed as in all other furnaces—the improvement being wholly in the mode of constructing the passage for the products of combustion under the boiler, from the grate to the chimney. The floor of this passage, instead of being a horizontal plane, or nearly so, running parallel to the bottom of the boiler at a greater or less distance from it, is constructed so as to present a succession of concave surfaces of an elliptical form. The bottom of the passage thus presents a surface to the boiler, somewhat resembling the surface of a body of water when thrown into a succession of rolling waves. These waves or undulations, if they may be so called, run transversely of the boiler, the tops or crests being from four to six feet apart, according to the length of the furnace, and being brought up within a few inches of the boiler, while the lowest part of the concavity is eighteen inches or two feet below the boiler. The passage to the chimney thus consists of a succession of semi-elliptical chambers, through which the heated air and gases must pass, and in which they become intimately mixed; thus securing the most perfect combustion of the volatile products and finely divided carbon, liberated from the fuel, which usually escape from the chimney; or they are deposited within it as soot, while in passing from each chamber to the succeeding one, the whole of the gaseous products are brought very closely to the boiler. This arrangement secures the most perfect development of the heat of the fuel, and gives the best facilities for imparting it to the boiler.

Below the chambers above described, is another series, having no connection with each other, but each communicating with the one directly above it. Into these chambers the ashes fall, and thus the passage is always kept free and clear.

This invention is cheap, simple, and effective, and may be applied to any boiler already in use, with the same ease as to a new one.

RECENT PUBLICATIONS.

The Old Red Sandstone; or, New Walks in an Old Field. By Hugh Miller, illustrated with numerous engravings. From the fourth London edition, 12mo. pp. 450. Boston: Gould & Lincoln.

This work has been sufficiently long before the public, to establish a reputation for its author, and a respectable place for itself. It has attracted additional attention, from the fact that its author never enjoyed the advantages of an early education, but commenced the world as a workman in a quarry. But he was a youth of observation and thoughtfulness, and turned the events passing before him to a useful account.

As a writer, he is vigorous and concise. Like one trained to dispatch, he uses the fewest words to express his thoughts. His illustrations are tinctured with the scenes of early life, and are drawn from the external objects which strongly impressed him. The value of the "Old Red Sandstone," in a scientific point of view, is well known, and the influence which it has exerted upon geological opinions, has been distinctly shown in more recent works. No one interested in such subjects, should fail of its perusal.

The Natural History of the Human Species: its Typical Forms, Primeval Distribution, Filiations, and Migrations—Illustrated by numerous engravings. By Lieut. Col. Chas. Hamilton Smith. With a preliminary abstract of the views of Blumenbach, Prichard, Bachman, Agassiz, and other authors of repute on the subject. By S. Kneeland, Jr., M.D. 12mo., pp. 419. Boston: Gould & Lincoln.

To investigate the natural history of man upon zoological principles, and to apply them to the aspects under which he has appeared at different periods, requires, as this author well says, "extensive researches in a multitude of directions—physiological, linguistic, religious, traditional, geographical, and migratorial." This, however, does not comprise the limit of these researches—the earliest traces of man found in the tertiary deposits, requires the aid of geology to explain the changes of the earth's surface. In the work before us, the author has displayed rich stores of these varied attainments, united with the facts and observations gathered during many years. Without noticing his opinion on many of the mooted and extremely interesting topics arising in an investigation of man's natural history, we would, at this time, recommend the work to those whose notice it has not yet attracted, as one of high ability and talent, and which treats the subject in a popular and instructive manner.

Principles of Zoology, touching the Structure, Development, Distribution, and Natural Arrangement of the Races of Animals Living and Extinct: with numerous Illustrations. Part I.—Comparative Physiology, for the use of Schools and Colleges. By Louis Agassiz & A. A. Gould. Revised edition, 12mo. pp. 225. Boston: Gould & Lincoln.

It is the aim of this work to furnish an epitome of the leading principles of the science of Zoology, as deduced from the present state of knowledge, and at the same time so illustrated as to be intelligible to the beginner. Some of the topics which the work contains are comparatively new in a treatise of the kind, and it is only recently that they have become of essential importance to a correct understanding of the general subiect. Those principles of Zoology, developed by Agassiz in his published works, have been adopted in this, with the addition of the results of many new researches. As a text-book for students, or as a treatise on the principles of Zoology, it is one of the best works, to serve as an introduction to the subject, which we have.

THE

MINING MAGAZINE.

EDITED AND CONDUCTED BY

WILLIAM J. TENNEY.

CONTENTS OF NO. VI., VOL. I.

ARTICLES.

ART.		PAGE
I.	THE VARIOUS MODES IN WHICH COAL IS WORKED IN ENGLAND, AND AN EXAMINATION OF THE PRACTICE IN DIFFERENT DISTRICTS. By J. KENYON BLACKWELL	559
II.	THE SILVER MINE OF "JESUS MARIA" in New Leon, Mexico	570
III.	THE COAL FIELDS OF BRISTOL COUNTY AND OF RHODE ISLAND. By PRES. E. HITCHCOCK	582
IV.	REPORT ON THE SUMNER, HIPP, FULWOOD AND LEMON MINES OF NORTH CAROLINA. By PROF. CHARLES UPHAM SHEPARD	591
V.	THE COST-BOOK SYSTEM; ITS PRINCIPLES AND PRACTICE	597
VI.	CONSIDERATIONS ON AMERICAN MINING OPERATIONS	605
VII.	NORTHAMPTON MINING DISTRICT	612
VIII.	SILVER OF LAKE SUPERIOR	612

JOURNAL OF MINING LAWS AND REGULATIONS.

Act of Incorporation of California Legislature........ 613

COMMERCIAL ASPECT OF THE MINING INTEREST.

Mining Stocks........ 617
" " in Boston........ 617
Fluctuations in do. for October........ 619

JOURNAL OF GOLD MINING OPERATIONS.

Deposits of California Gold at U. S. Mint........ 620
Capital invested in California Water Companies........ 621
Water Companies' Convention........ 621
A New Mining Canal........ 622
Yield of River Claims in California........ 622
Tax on Foreign Miners........ 623
Quartz Mining in Nevada, California........ 623
Increase of Gold in Australia........ 624
Gold Receipts and Exports from Melbourne........ 625
Yield in New South Wales District........ 625
Mining Operations in Australia during the Winter........ 626
Experience of Californians in Australia........ 627
Conrad Hill Mine, North Carolina........ 628
Gold Deposits in South Carolina and Georgia........ 628
Russian Gold Mines........ 629
Production of Gold in the British Islands........ 629
Improvement in Gold Washers........ 630
Improvements in operating upon Auriferous Quartz, &c........ 631
Gold Mines in Chihuahua, Mexico........ 631

JOURNAL OF COPPER MINING OPERATIONS.

	PAGE
The Ontonagon Mining Range	682
Minnesota Mine	683
National Mine	683
Norwich Mine	684
New Mine at Ontonagon	634
Ohio Trap Rock Company	684
Cliff Mine	686
Fulton Mine	687
North American Mine	637
Canadian Mining Licenses	637
Perkiomen Consolidated Mining Company	638
Springfield Copper Mine	638
Brass Founding	639

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

Production and Prices of Lead at Galena	643
Prospects for Mining Enterprise in Mexico	643
Richness of Mexican Silver Mines	646
Silver Mines in Piqua Valley, Penn	646
Silver on Lake Superior	648
Silver Ore imported into England	648
The Market for Western Lead	648
Extensive Lead Deposit	649
Lead Mine in Iowa	649
Produce of Lead in Great Britain	649

COALS AND COLLIERIES.

Anthracite Coal Trade for 1858	652
Cumberland Coal Trade for 1858	652
" " Basin	652
Large Lump of Coal	653
The Schuylkill Coal Trade	653
Coal Fields and Coal Mines in the Western States	654
Boring for Coal	657
Anthracite for Locomotives	658
Investigations Relative to Explosions in Collieries	659
California Coal	662
Coal for Iron Foundries	662
New Method of Coaling Steamships	662

IRON AND ZINC.

Iron Manufactures in Pennsylvania	663
Lake Superior Wrought Iron Manufacture, under Renton's Process	664
Importations of Bar Iron in the United States	665
Mount Savage Iron Works	665
The Swede Iron Company	665
Sharon Iron Company	655
Manufacture and Importation of Iron	665
Iron Manufacture in Austria	667
Rhenish Charcoal, Iron and Steel Company	669

QUARRIES AND CLAYS.

Drummond Island Quarry	670
Buhr Stones	671

MISCELLANIES.

Gardner's Crusher and Amalgamator	671
Engines for Mining Purposes	671
The New Assay Office	671

THE

MINING MAGAZINE:

DEVOTED TO

Mines, Mining Operations, Metallurgy, &c. &c.

VOL. I.—DECEMBER, 1853.—No. VI.

ART. I.—THE VARIOUS MODES IN WHICH COAL IS WORKED IN ENGLAND, AND AN EXAMINATION OF THE PRACTICE IN DIFFERENT DISTRICTS.*—BY J. KENYON BLACKWELL, GOVERNMENT INSPECTOR.

THE systems or modes of working coal may be divided into two classes, which are usually called the pillar or post and stall, and the long wall systems. The pillar and stall method is that in which the operation commences by intersecting the seam of coal intended to be wrought, by passages or drifts formed at convenient intervals, and at right angles to each other, pillars of coal being left standing between the intersections of these drifts for the support of the roof. The long wall method is that in which the whole of the coal seam is obtained at once, by working on the face of a bank or wall of solid coal, which is removed uninterruptedly, in convenient lengths, in one direction, the roof of the seam being allowed to fall, or close gradually, in the other.

The variations or modifications which occur in these two systems may be classified in the following manner. The three first variations affect the order in which the workings proceed, the two latter the form of the works.

The first variation is common to both these systems. It is found when the coal is worked out in one operation, either wholly, or to as large an extent as may in the end be possible, excepting so much as may be required, temporarily, for the support of the working ways or roads of the mine; this operation being commenced at or near the bottom of the shafts, and being continued onward from that point, leaving no coal behind.

The second variation is also common to both systems, and occurs when the working ways or roads, only, are driven out first, to the extent or outside of the tract of coal proposed to be wrought, before the working of the coal is commenced.

* From a Paper presented to both houses of Parliament.

A third variation, applicable only to the pillar and stall system, is that of a partial working of the coal in boards, bays, or stalls, as the ways or roads progress, the larger part of the seam being left in pillars (or as it is usually termed, waste or broken), to be wrought out in returning. About one third of the quantity ultimately realized is generally taken in this first operation, but this proportion is sometimes increased.

A fourth modification, in which the pillar and stall, and long wall systems are united, is effected by working the coal in banks of considerable, but varying widths, pillars of coal being generally left between the separate banks, to secure the roads leading into them, and to divide the weight on the face of the bank. Other pillars are also left between the goaves* formed by the working banks, and the main ways or roads of the mine, for the protection and support of these roads.

A fifth modification, connected with the pillar and stall system, is caused by the nature and thickness of the seam to which it is applied in South Staffordshire, especially by the necessity of secluding the goaves which are formed in working, from the action of the air, by leaving ribs or barriers of coal surrounding the sides of work or chambers in which it is wrought.

The comparative advantages or disadvantages of these different systems of coal mining can only be determined by the examination of the circumstances of each individual case. In general one or two are practised, to the exclusion of the others, in each of the various coal districts; their selection having been the result of experience, with regard to the nature, thickness, and other peculiarities of the seams of coal, their roofs and floors, or super and sub incumbent strata, and other similar conditions.

SYSTEM PRACTISED IN NORTHUMBERLAND AND DURHAM.

The pillar or post and stall system, employed almost universally in Northumberland and Durham, has been greatly varied from time to time. Originally the pillars were only left of such a size as was necessary for the support of the roof during the operation of working the coal in boards or stalls, driven at right angles with the cleat or cleavage of the coal, with cross-intersections or headways driven on the end or parallel to the cleat, at convenient distances, for air and temporary wagon ways, connecting the whole with the main or permanent ways of the mine. As the works progressed, the falling of the roof and the creeping or swelling up of the floor soon closed these old workings, rendering their ventilation unnecessary; the only thing requisite being the

* Goaf or goaves—that part of the mine from which all the coal has been wrought away, and where the roof has fallen or subsided.

preservation of the main wagon and air ways, which passed through them, from the shafts to the face of the workings beyond, in the solid coal. The smallest possible quantity of coal was therefore left in the pillars, as it was always abandoned, and the ventilation was confined to the working faces of the boards in the whole coal. At a subsequent period, from the coal being wrought at greater depths, and under greater pressure than it had previously been, it was found necessary to leave the pillars larger, and at the same time to restrict the width of the openings, in order to prevent the coal from being crushed by the weight of the roof, and the wagon and air ways from being destroyed by a general creep of the floor of the seam.

This change in the relative quantity of coal obtained by the first process, rendered it necessary to attempt the working of the pillars, thus left, by some subsequent operation, and to maintain the ventilation of the waste thus partially exhausted, both on account of its still yielding fire-damp, which could not be allowed to accumulate without danger, and for the purpose of rendering it accessible to the future operations.

The working out of the pillars, however, caused the formation of goaves, or tracts in which the strata above the coal had broken down, after the latter had been entirely wrought out, which the ventilating currents could not penetrate effectually. These became a new source of danger, from the accumulation of fire-damp in them, which filled the cavities that were thus formed over extensive areas, above the level of the seam. At the same time, the maintenance of the ventilation of the wastes, by coursing the air, or passing it backwards and forwards, in parallel columns, through all the excavations of the mine, lengthened very greatly the distances it had to travel, impeding and weakening the ventilation, which had formerly been confined in a single column, along the working board faces in the whole coal.

The invention of the Davy lamp provided in some degree for the first difficulty, namely, that caused by the necessity of working pillars in contiguity to fiery goaves. The plan of splitting the air, also introduced, by reducing the friction on it, through the increased aggregate sectional area obtained in the air ways, and by shortening the run or length of the currents, removed the last.

The system of air courses in the mine having generally been arranged at an earlier period, and without reference to the maintenance of the ways and ventilation in those sections of the pit in which these goaves might be formed, the result was, in general, the postponement of pillar working until the whole of the tract of coal intended to be wrought had been reduced to the state of waste or broken, and until the complexity of the necessary air

courses for pillar working (excepting when the goaves formed could be left behind, at the outside, or boundary of the mine), might be avoided by commencing this process at the boundary.

Very large tracts of coal were thus reduced to a state of waste, many years before the larger part of that which had been left in the pillars could be gotten. The quality of this coal was injured by the crush or weight which was brought on it by the first process. The ventilation of the whole of the pit was greatly impeded by the friction on the air, caused by the length still necessitated in the air courses, which were required to traverse all these wastes. The intake air, also, before it could reach the working districts from the shafts, had to pass these wastes, through which the outcoming currents or returns also travelled, divided from the latter only by weak and imperfect stoppings. It was, therefore, in general so reduced by leakage into them, that a very small part of it remained when it reached the working boards, or face of the whole coal, where the men were engaged, and where a powerful current was needed.

These inconveniences led to a further change, namely, that of dividing the pit into separate sections or panels, isolated from each other by barriers of coal; each of these sections possessing, as far as possible, a separate and detached system of air courses, the length of which was thus greatly reduced. The working of the pillars was then made to follow closely on that of the whole coal, with only a thin barrier of coal intervening between the panels, or according to the most recent practice, by interposing, by coursing, a barrier of air between the whole coal and pillar workings, the weight of the air, tending towards the upcast shaft, being so directed as to bear strongly on the face of the goaf.

By the adoption of this system of division, and by the reduction of the extent of workings, open at any one time, to that which is necessary to supply the required production of coal, the wastes of a mine, needing ventilation, may be reduced to a mere fractional part of their former magnitude; and at the same time, the run or length of the air currents, and also their friction and leakage, would be proportionally diminished.

Another important advantage from these changes, is that when the districts, formed by a judicious system of division, are properly isolated from each other, by barriers of coal and substantially formed stoppings, an explosion taking place in one of them will in general be only partial in its effects, and not compromise the lives of those persons working in the other divisions.

The peculiar character of the coal field and coal measures of Northumberland and Durham has produced the system which has been adopted there. The mines are worked at greater depths than in any other district. The strata are in general only slight-

ly inclined, and very large tracts are found nearly or entirely free from faults, permitting the workings to be extended, without difficulty, in every direction, from a given point. The measures associated with the coals are strong, and the roofs heavy. The principal seams of coal are from 4 to 6 feet thick, and free from large partings of shale. They are bituminous in their nature, containing a large proportion of volatile matter, and consequently tender, with frequently occurring parallel cleavage, in a determinate direction, and imperfect cross joints, rendering the fracture of the coal cubical. The general, but somewhat varying course of this cleavage, corresponds in some degree in all the various coal fields, although its development is very different, and usually characteristic of the particular district to which it belongs. The line of direction to which this cleavage conforms is generally a few degrees west of magnetic north, but it is liable to local disturbances.

SYSTEM IN LANCASHIRE.

The mode of work pursued in Lancashire presents only some modifications of the Newcastle system, caused by the different nature of the seams of the district, and other attendant circumstances.

The frequent occurrence of faults, which in general run parallel to each other and divide the field into comparatively narrow belts; the greater number of the seams, and the lesser depths to which they have hitherto been worked; their consequent greater accessibility; together with their generally considerable inclination, have restricted the extent of workings connected with one pit, and made the line of level course the guiding point, in the arrangement of the works.

The coals of Lancashire resemble, in some degree, those of the Newcastle field. They are in general bituminous, and consequently tender. They are also cubical in their fracture. The seams which are worked vary from less than 3 to 9 or 10 feet thick; but the latter thickness is not common. Those most extensively wrought are from 4 to 4½ feet thick. They are frequently divided, especially the thicker beds, by partings of shale. Their roofs are, in general, not strong, and their floors are of a nature rendering them very liable to creep or swell. The angle of inclination at which they lie is considerable, but varying, in different cases, from 4 to 18 inches in the yard; the mean between these extremes being most common. The coal seams are dispersed throughout a great thickness of measures, which prevents more than a small number from being worked by one winning.

As the line of level course in the measures varies continually, while the direction of the cleavage is nearly constant, the arrange-

ment of the works is necessarily so modified as to conform, as much as possible, to both. The main water, wagon, and air ways, are driven on the level course of the seam. The working drifts, corresponding with the boards of the Newcastle district and the stalls of South Wales, are sometimes carried to the rise, sometimes on the level course, as the direction of the cleavage may require. If these working drifts are carried on the level course, they have to be connected with the main wagon ways, by headways or brows, driven to the rise, intersecting the main ways at right angles, or sometimes at one of 45 degrees, in order to reduce the inclination. If the course of these working drifts, to face the cleavage, be to the rise or parallel to that of these headways, the former require to be connected with each other by other openings or ways (sometimes called ends), driven on the level course for the purpose of ventilation and temporary roads. The seams of coal have thus been usually partially worked by this operation, the pillars formed from the intersection of the working drifts, by the other cross series of openings or ways, being left to be wrought by a subsequent process.

The floors of the coals in Lancashire being very liable to heave or creep, all the intersecting drifts or strait work have been necessarily carried much narrower than the boards and headways of the Newcastle district. In order, therefore, to obtain an equal proportion of the seam by the first operation, the practice has been to leave much thinner pillars. They have usually been formed from about 8 to 10 yards on the rise, by 20, 30, or 40 yards on the level course. The thinness of the pillars thus left has been found an evil, from their consequent failure to resist the weight thrown on them, and the greater tendency of the floor to creep. But it has been in some degree necessitated by the steep inclination of the strata, the weakness of the roofs, and the heaving nature of the floors just referred to, which render it difficult, in many cases, to carry the drifts wide enough to permit the use of brattices to the same extent in ventilation as in the Newcastle district.

From the steep inclination of the seams, and the facility of sinking, arising from the comparative shallowness of the present winnings and the character of the measures, the extent of ground worked from a given shaft or shafts has usually been much smaller than in the north. The range of each winning, to the rise and to the deep, has generally been very narrow; but its extent on the level course considerable, and only terminated by intersecting faults. It has hitherto been a general practice to work out as large a proportion of the seam as was considered safe at the first operation, the narrowness of the intersecting drifts being compensated by leaving thin pillars between them. This

narrow or strait work was carried forward, as the main ways, driven on the level course, advanced, the coal being left in a state of waste or pillar between the shafts, and the face of the drifts in the whole coal. That part of the seam thus left in pillar was not usually worked until the boundary of the mine, in each direction, had been reached by the drifts, both on account of the difficulties in ventilation under the customary system, which would have been the consequence, and the crush and creep which would have been produced in the measures. That part of the coal first wrought out was generally too large a proportion of the seam, and that which was left was much deteriorated, through the weight brought on it by this partial working and by the action of the air. The ventilation also of these wastes, and even the maintenance of the main air ways, was rendered difficult by the same cause. At the same time the weak ventilation (caused by the small size of the air ways, in conjunction with the general neglect of splitting the air and thus obtaining a large total quantity in its aggregate volume) was further diminished at the face of the workings in the whole coal, where all the men were engaged, and where a large yield of inflammable gas was taking place, by the leakage which occurred through the imperfect stoppings employed to separate the intake from the return air.

In this coal field, the neglect of splitting the air, and the want of sufficiently large and well-arranged air courses, often necessitates its use after it has passed through extensive workings, and after it has been brought into contact with goaves containing stagnant fire-damp, and has thus become much vitiated and loaded. These goaves generally contain stagnant fire-damp, on account of the air ways required not being provided to permit the escape, on the rise side or from the more elevated edges of the goaves of the inflammable gas which they yield, its only channel of escape being into the working currents passing along their face, which have to be used by the miners, and in which naked lights are commonly employed.

This system of reducing the whole of the seam to the state of pillar or waste, long before these pillars could be wrought out, is now in many cases abandoned; wider ranges of coal are laid open, permitting sufficient pillars or barriers to be reserved for the security of the necessary ways or roads, and these main ways are driven to an outside or boundary before the working of the coal is commenced, thus leaving the goaves or dangerous parts of the mine behind, while the necessary air courses are provided to carry off the fire-damp, which may be yielded by them without its entering the working air.

The mode of working and of ventilation in this and in other districts may, however, be so arranged as to afford security both

to the roads and to the air currents of a mine, without carrying all the required roads to the extreme boundary before any coal is wrought. But to effect this, much larger barriers of coal are needed for the support of the air and wagon roads than are now usually left. A complete and perfectly distinct system of intake and return air ways is also necessary, so as to permit the ingoing air to be split, at any point, and any section or part of the workings to be isolated in respect to its ventilation from the others.

The steep inclination of the measures common in this district (which has caused the necessity to adopt, in working, a single line of incline, in order to concentrate and transmit to the main levels and shafts, all the coals worked from a considerable distance on each side of it) prevents the introduction of the system of coursing the air in an effectual manner, to form a barrier between the whole coal and pillar workings, from the non-admissibility of the necessary stoppings between the face of the workings and the line of incline in use.

The inclination of the measures, and convenience in individual cases, will determine whether the ranges of coal to be worked are previously to be intersected (as shown in the general plan) by air and wagon roads, in two series of drifts, parallel and at right angles to the level course, or by one principal series uniting the level course with the face of the workings at an angle of from 30 to 45 degrees, or such other as may suit the inclination of the strata. Either of these modes of working may be connected indifferently with the general ventilation.

SPECIAL CASES OF DEPARTURE FROM CORRECT PRINCIPLES IN LANCASHIRE.

Notwithstanding that superior arrangements and regulations, accompanied by a good ventilation, are to be found in many of the collieries of this district, there are also numerous others in which the supply of air is defective, and its condition dangerous. There are instances to which the following remarks will apply :—

In some, the upcast shaft is greatly below the dimensions in its sectional area which it ought to have, to admit a sufficient circulation.

In others, from the upcast column being returned to the surface by small wooden or other pipes fixed in the downcast shaft (and this even in deep mines), it is not only insufficient in its volume for the supply of a proper quantity of air for safety and health, but insecure against the slightest shock.

The furnace is usually placed on the surface in mines under the last condition; and as only a small part of the upcast

column can then be rarefied, another cause of weak ventilation is added.

In some cases, especially, where two or more seams are worked, the downcast shaft is not accessible to all the men engaged, thus rendering escape more doubtful in the event of accident.

Another defect is the small size of the air ways to which the air is confined throughout the works. The ventilation is thus often very weak, and the air heavy and unwholesome, even where there is no fire-damp.

Narrow or strait work is driven too far without openings for ventilation or brattice.

The openings are frequently made up with imperfect stoppings of dirt, allowing the intake air to leak into the returns.

Pipes are sometimes used, instead of an intake or return drift, to convey the ventilation through long distances, from one section of the pit to another.

Drifts, in which fire-damp can collect, are left without circulation.

Heavy or foul return air currents are allowed to pass to the upcast shaft by wagon roads, in which naked lights are used.

The working of pillars is carried on in contact with goaves containing fire-damp, without using the Davy lamp; or in cases in which the Davy lamp is used, it is not under proper regulations.

The workmen are sometimes compelled to find lamps themselves where danger exists; and as the use of the lamp is not absolutely enforced in these cases, its employment, where necessary, is often neglected.

The men are compelled, in numerous cases, to work in an explosive atmosphere, whilst driving narrow work in the whole coal, for want of brattice or pipes to carry the air up to the face. There are cases in which they have to work constantly with their lamps full of fire.

Ventilation is sometimes neglected, and the Davy lamp used as a substitute for it.

Dangerous shafts and tackle are used to descend and ascend.

In some cases there is no proper system of rules enforced, particularly for the examination of the works in the morning, before the men commence to work.

SYSTEM IN SOUTH WALES.

The system of work generally adopted in South Wales is analogous to that practised in the two districts already referred to. The seams of coal worked are chiefly from 4 to 8 feet in thickness, with little shale interposed in the partings. In some cases a

greater thickness is brought together by the contact of two or more seams; but a considerable amount of shale is then usually found intervening between the associated beds. In the north-eastern part of the basin nearly all the principal seams lie so near together, that the same winnings may be rendered available for them. In the south-western part, the thickness of the associated strata is so greatly increased, that more than one or two seams can rarely be attained by one winning. The inclination of the measures along the outcrop edges of the basin may be stated at from 3 to 6 inches in the yard on the northern, and from 9 to 18 inches on the southern edge. This inclination diminishes on passing toward the centre, where the strata are nearly or quite horizontal. The measures of the district are generally strong and regular, permitting the drifts to be carried wide, and the extent of each mine to be considerable. The coal seams exist in the form of an oblong basin, the longer axis of which ranges from north-east to south-west. The position of these strata is not conformable to the outline of the surface. From the form of the latter, which consists of a great number of parallel or branching valleys, and intervening mountain ridges, having a general north and south direction (nearly coinciding with that of the majority of the principal faults, except along the eastern and western boundaries), the localities in which winnings can be made are chiefly confined to the valleys, from which the superior strata have been denuded. As the deeper portions of the district in which future winnings will have to be effected must be worked by sinkings in the valleys, and not, as hitherto, by levels in the sides of the mountains, this circumstance will produce extensive operations, with only one point from which ventilation can be obtained. It will therefore render permanent and secure lines of intake and return air ways highly important to the safety of these operations; and will compel the introduction of a system by which the pillars can be completely and effectually wrought out, whilst the wagon and air ways of the mine are maintained.

The character of the cleavage which exists in the coals of this district is peculiar. The joints, which are formed by its occurrence in the coal, are termed, according to the direction in which they are crossed in working, faces or backs. This cleavage is inclined at an angle of about $67\frac{1}{2}°$ to the plane of the seam, while that which occurs in the coals of the other coal fields of this country, is nearly or perfectly vertical. The main joint is also crossed by another somewhat imperfect one, having the same line of direction as the former, but a contrary inclination as regards the plane of the seam. The latter series of joints are called riders. This peculiar cleavage, however, is not so fully developed in some

parts of the South Wales coal field, as in others. The north-eastern end of the basin affords an example of this.

In this district, as in Lancashire, in those parts of the coal field hitherto worked, the inclined position of the measures has made the line of level course the guiding point in the arrangement of the workings. The greater or less development of the cleavage, and the greater or less facility with which drifts could be carried, either parallel, or at right angles to the main ways of the mine, have determined their exact form. Thus, in the different parts of the district, the working drifts or stalls are carried on the level course, or on the rise of the strata, and the pillars left between them are either long and narrow, or square and wider, according to the greater or less facility with which cross or intersecting headways can be driven.

Little change has taken place in this coal field, in the system of work and ventilation now adopted, compared with that of former periods. The drifts or stalls, corresponding with the boards of the north, are still carried very wide, and the pillars between them left very thin, in the first operation. Little attention is paid to the subsequent complete working out of these pillars. There are, frequently, no separate return air courses, except such as can be maintained through the old wastes or along the edge of goaves. From the width which the stalls are worked, the roof in the wastes commonly breaks down, and allows the fire-damp which is yielded in them to accumulate. On account of this imperfect state of the ventilation, and the neglect to divide the workings into separate sections, with the necessary air ways to provide for the isolation and security of the goaves, which are formed by pillar working, a large part of the coal in fiery seams, which might be obtained, is abandoned. The air is not generally split in this district, even in extensive mines, and from the comparatively small sectional area of the air ways, to which it is thus confined, the ventilation is often weak, even in the thickest seams. At the same time, from the practice of carrying it in one column from level course to level course, and from one cross heading to another, through the whole of the works, it becomes very heavily loaded before it leaves the men, by its receiving all the gases yielded by the coal, whether in the whole, in the wastes, or from the goaves, the powder-smoke from blasting, and the carbonic acid formed by the breathing and lights of the men. There are cases in which it would be explosive, were it not for the want of oxygen, and the deleterious but noncombustible gases with which the carburetted hydrogen it contains is mixed.

In arranging the system to be pursued in extensive workings, in which the mode practised in South Wales is adopted, the following principles should be observed.

The section or range of coal connected with each level course ought to have a complete system of intake and return air ways. These should be carried in barriers of coal, of sufficient width to secure them, while the pillars in the middle of the range are in process of being wrought out in regular succession to the whole coal workings, and until the level course itself reaches the boundary which is proposed for it.

This would require each level course to be flanked on both sides, by return air ways, and permit the goaves which would be formed between each range of levels, closely following the whole coal workings, to discharge any inflammable gas they might yield into the return way to the rise; that is, into that which flanks the next level on its deep side. The extent of coal assigned to each level course, and the volume of intake air split off to each level, ought to be proportioned to each other. Each cross heading should be bounded on one side by a pillar of sufficient thickness, for the formation of a return air way connected with it; and it should be driven out, along with this parallel air way, into the next range of levels and air ways, before any stalls are turned out of it.

It would be desirable to drive the stalls narrow, and to leave the pillars two or three times their present usual thickness; since if the necessary air ways were formed and maintained, the pillars might be completely wrought out in proximity to the whole coal workings; as soon as all the stalls in each cross heading were exhausted, powder could be dispensed with, and the Davy lamp substituted for naked lights.

The modifications of the Newcastle system appear to be applicable to working many of the coal seams of South Wales. To some of the seams, especially those which contain interposed beds of shale, and in which the cleavage is not strongly defined, the Yorkshire system would be found suited.

Art. II. THE SILVER MINE OF "JESUS MARIA," IN NEW LEON, MEXICO.

It is a circumstance worthy of notice, that amid all the revolutions which have taken place in Mexico, mining is prosecuted with more regular and systematic industry, than any other pursuit, and the rights of the miners are more steadfast and secure than those of any other class of citizens. Doubtless this is to be ascribed to the importance of the mining interest, in the opinion of the Government and people, and to the wise and just laws adopted for its regulation. Of all the interests in which capital

can be employed in Mexico, mining is said to be the most secure. There is not an instance since the Conquest, nor since the Revolution, of any attempt having been made by the government to interfere with the mode of working adopted by individuals, or to diminish the profits of the successful adventurer, by exacting, under any plea or pretence, from the more fortunate, any thing that was not under the *Ordenanzas de Mineria*, payable by the poorest miner.

These *Ordenanzas* were framed by the old Spaniards, and are still in force in Mexico. They secure the most perfectly guarded incorporated rights to companies working under them. It is thus the English have worked with security, with their investment of twelve or fifteen millions, and with their head-quarters in London. These *Ordenanzas* seem to provide for almost every conceivable necessity. No individual shareholder is liable for a greater amount than he obliges himself to expend in the working of a mine.

A shareholder refusing to pay his share of the expense, when called on to do so, exposes himself (after four months' notice from the other owners) to a forfeiture of his share; and this is all the demand that can be made against him. As with chartered companies in this country, no one loses a greater amount than he subscribes for.

No debt can be created against a mine but by duly authorized persons; those, indeed, and those only, who are immediately connected with the management.

The debt of a mine can only be equal to the money expended; and should the mine, by any misfortune, fail to pay back that money, the mine itself is the *debtor, and the only debtor*, unless special agreement between the parties make it otherwise.

No individual is ever called on to pay more than his voluntary instalments, and then only in proportion to the share he represents. Individual responsibility beyond this, there is none.

The following is an outline of the system adopted in working silver mines and purifying the ores:

The *Administrador*, or *Director*, has the immediate management of the affairs of the Company, subject to the general instructions of the Board of Directors; purchase of supplies, employment of *dependientes* and workmen; revision of the accounts of the Contador; supervision of all employees; transmission of reports to the Board at stated periods; weekly consultations with the *Minero* (miner), *Azogüero*, *Esayador* and *Quebrador*, regarding the state of the negotiation and the projected operations; the creation of good relations with the civil authorities and neighboring population.

The *Contador* has charge of the stores and materials belonging to the mine, and is treasurer and accountant. Issues and pay-

The number of the *Engineers, Carpenters, Smiths, Masons, Barreteros, Peons, Muleros*, &c., &c., is according to the wants of the negotiation.

No industrial exhibition can surpass in system and activity a well organized and directed mine. By day and by night it is all the same. As the door of the mine is unlocked in the evening for the day laborers to come out, another set are ready to go down, when the door is again locked, only to be again opened for the same change to take place in the morning. Every one has his place and his duty assigned; and there is no possible escape from a faithful execution of his task. The *Bomberos, Paleros, Mineros de Destajo*, and *Overseers*, are all on duty. The tepetate or rubbish is carried by *Peons* to the *despatch*, from whence it is hoisted. The ores are sent up in sacks, each containing a label, which indicates the *drift, pozo*, or portion of the mine from which it comes. These are overhauled and assorted by the *Quebrador*, and if not sent up in good order, a minute is made of it, which appears by a reduction in the wages, on the *Memoria* or pay day, which takes place every Saturday. At a stated hour all the hands appear in a crowd; those below, or otherwise unable to attend, have some one to answer for them. The *Memoria* contains the name of every person, of every grade, employed in or about the mine, the character of his labor, where employed, the amount of his compensation, whether by the day, task or job, the number of days and the very days he worked. The same for the varied works going on in the *Hacienda*, embracing the employees of every description, for every manner of work performed or services rendered. The whole settlement for the week's work is done in public. If any dispute arise, it is summarily settled, and can never be opened again.

These weekly *Memorias* are recorded in a book kept for the purpose, and the originals, certified by the *Contador* and *Director*, transmitted to the headquarters of the Company, wherever it may be.

The miner also makes out his weekly report to the Director. This contains a condensed but perfectly intelligible synopsis of all the works under ground during the week. The amount of *Cuele*, number of yards cut in each drift, rubbish removed, the amount of metal knocked down, of *cargas* sent up, the quality of each, the amount sent to the Hacienda, with the number and character of all the workmen under his direction, with their names and the exact point or place in every drift where the work has been performed.

Next follows the report of the *Azogüero*, or chief of the Hacienda. This shows the amount of ore that has been passed over to him, its value per carga, the quantity on hand, the

quantity reduced during the week, how it came out, above or below the assays, how much *bullion*, if any, handed over to the Contador, the process by which it was extracted, whether by *fundicion* (smelting), by the cazo (copper-kettle), or by the *patio* (amalgamation); the amount of quicksilver used in each parcel or process, the quantity on hand, and what percentage lost by each washing, &c., &c. There is, also, a monthly statement made out from all these *memorias*, recorded and forwarded to head-quarters.

Then comes the quarterly return. It gives an account of every implement or tool on hand, from the smallest drill up to the engine; all the stores of supply of every description, and the amount or quantity expended in each; the work performed in each *labor*, not only for the quarter, but from the commencement; the ores taken out, quality and quantity; the aggregate of each week's memoria or expenditures; the number and class and wages of all persons employed; the amount and description of all work done in the *hacienda*, &c., &c. This is also recorded, and the original, duly certified, is sent with the weekly *memorias* to head-quarters; and from them may be seen the result of every single day's work during the quarter, and with a certainty that admits of no mistake.

The treatment of the ores presents some very interesting particulars, which are thus described by Mr. Ward in his sketch of the mines of Mexico:

> The *hacienda*, of which a representation is given below, contain forty-two crushing mills, called *arrastres*, and thirty-six stampers. The ore, on being extracted from the mine, is placed in the hands of the *pepenadores*, men and women, who break all the larger pieces with hammers, and, after rejecting those in which no metallic particles are contained, divide the rest into three classes (inferior, middling, and rich). These are submitted to the action of the *morteros* (stamps), one of which, of eight stampers, is capable of reducing to powder ten cargas of ore (each of 350 lbs.) in twenty-four hours. This powder not being thought sufficiently fine for the quicksilver to act upon with proper effect, it is transferred from the *morteros* to the *arrastres* (crushing mills, see wood-cut), in which water is used. Each of these reduces to a fine impalpable metalliferous mud, six quintals (600 lbs.) of powder in twenty-four hours. At Guanajuato, where water-power cannot be obtained, the *arrastres* are worked by mules, which are kept constantly in motion at a slow pace, and are changed every six hours. The grinding stones, as well as the sides and bottom of the mill itself, are composed of granite; four blocks of which revolve in each crushing-mill, attached to cross-bars of wood. This part of the operation is thought of great importance, for it is upon the perfection of the grinding that the saving of the quicksilver is supposed in a great measure to depend, in the subsequent amalgamation. The grinding is performed usually in a covered shed or gallery, which, in a large *hacienda*, from the number of *arrastres* at work at the same time, is necessarily of considerable extent.

The *patio*, or amalgamation floor, is a large flat space, open to the sky, 312 feet in length, by 236 in breadth, and securely surrounded by strong walls. It is paved with large unhewn blocks of porphyry, and is capable of containing 24 *tortas*, or flat circular collections of *lama* of about 50 feet diameter, and 7 inches deep, when the patio is not filled (but of somewhat smaller dimensions when nearly so) ranged in 4 rows, and numbered from the left-hand corner. At one end a small space is generally set apart for the assays, which are made each on one monton.

The following description of Mexican amalgamation is given by Captain Lyon:

A torta of Zacatecas contains 60 montons of 20 quintals each, and is thus formed: — In the first instance, a square space, of the requisite size for a torta, is marked out, and inclosed by a number of rough planks, which are propped in their places on the patio floor by large stones, and dried horse-dung and dust are piled round their edges to prevent the escape of the lama. A heap of saltierra (salt mixed with earthy impurities) is then piled in the centre, in the proportion of two fanegas (each = 1·6 English bushels) and a half to the monton, = 150 for the torta. After this, the lama, or ore ground into a fine paste, is poured in. When the last or 60th monton is delivered, the saltierra is shovelled down and well mixed with the lama, by treading it with horses, and turning

it with shovels; after which the preparation is left at rest for the remainder of the day. On the following day comes the *el incoporo*. After about one hour's treading by horses, the magistral or roasted and pulverized copper ore is mixed with the lama, (the *repaso* or treading-mill still continuing,) in summer in the proportion of 15 cargas of 12 arobas (25 lbs. each) to the torta, if the ore be of 6 marcs to the monton, and in winter in only half the quantity. For it is a singular fact, that in summer the mixture cools, and requires more warmth; while in winter it acquires of itself additional heat. With poorer ores, as for instance those of 4 marcs to the monton, 12 cargas are applied in summer, and 6 in winter. From November to February, lime is also occasionally used to cool the lama, in the proportion of about a peck per monton.

The *repaso*, or treading out, is continued by six horses, which are guided by one man, who stands in the lama, and directs them all by holding all their long halters. This operation is much more effectual in a morning than an evening, and occupies about five or six hours. When the magistral is well mixed, the quicksilver is applied, by being sprinkled through pieces of coarse cloth doubled up like a bag, so that it spurts out in very minute particles. The second treading of the horses then follows; after which the whole mixture is turned over by six men with wooden shovels, who perform the operation in an hour. The torta is then smoothed and left at rest for one entire day, to allow the incorporation to take place. It undergoes the turning by shovels and treading by horses every other day, until the amalgamator ascertains that the first admixture of quicksilver is found to be all taken up by the silver; and this he does by vanning or washing a small quantity of the torta in a little bowl. A new supply is then added, and when this has done its duty, another is applied to catch any stray particles of silver. On the same day, after a good repaso, the torta is removed on hand-barrows by the laborers, to the *lavaderos*, in order that it may receive its final cleansing. The general method of proportioning the quicksilver to the tortas, is by allowing that every marco of silver which is promised by trial of the ores as the probable produce of a monton, will require in the whole process 4 lbs.

In metals of five to six marcs and a half per monton (of the average richness of Zacatecas), 16 lbs. of quicksilver were incorporated for every monton, = 900 lbs. for the torta. On the day of the second addition, the proportion is 5 lbs. the monton; and when the torta is ready to receive the last dose of quicksilver, it is applied at the rate of 7 lbs. the monton, = 420 lbs.; making a total of 1620 lbs. of quicksilver. With poorer ores, less quicksilver and less magistral are required.

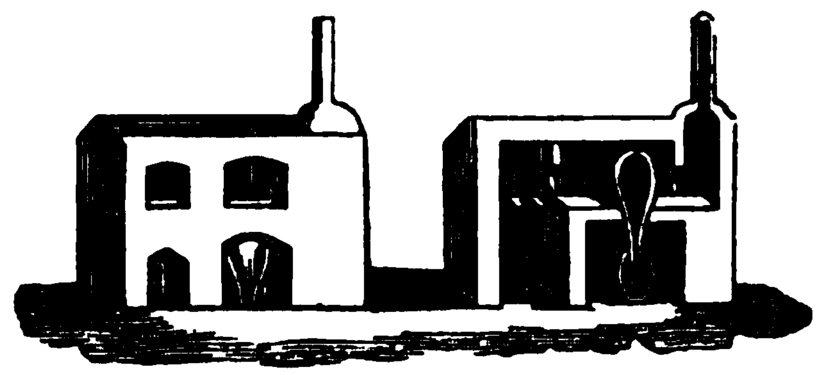
The usual time for the completion of the process of amalgamation, is from 12 to 15 days in the summer, and 20 to 25 in the winter. This is less than a third of the time taken at some other mines in Mexico. This rapidity is owing to the tortas being spread very flat, and receiving thereby the stronger influence of the sun. In the Mexican mines, only one monton is commonly mixed at a time; and the lama is then piled in a small conical heap or monton.

Lavadero, or washing vat.—Here the prepared tortas are washed, in order to carry off the earthy matters, and favor the deposition of the amalgam at the bottom. Each vat is about 8 feet deep, and 9 in diameter; and solidly built in masonry.

A large horizontal wheel, worked by mules, drives a vertical one, which turns a horizontal wheel fitted round a perpendicular wooden shaft, revolving upon an iron pivot at the bottom of the vat. To the lower end of this shaft, four cross-beams are fitted, from which long wooden teeth rise to the height of five feet. Their motion through the water being rapid, keeps all the lighter particles afloat, while the heavier sink to the bottom. The large wheel is worked by four mules, two at each extremity of the cross-beam. Water is supplied from an elevated tank. It requires 12 hours' work of one tub to wash a torta. Eight porters are employed in carrying the prepared *lama* of the

torta in hand-barrows to the vats. The earthy matter receives a second washing.

The amalgam is carried in bowls into the *azogueria*, where it is subjected to straining through the strong canvas bottom of a leather bag. The hard mass left in the bag is moulded into wedge-shaped masses of 30 lbs., which are arranged in the burning-house, to the number of 11, upon a solid copper stand, called *baso*, having a round hole in its centre. Over this row of wedges several others are built; and the whole pile is called *pina*. Each circular range is firmly bound round with a rope. The base is placed over a pipe which leads to a small tank of water for condensing the quicksilver; a cylindrical space being left in the middle of the *pina*, to give free egress to the mercurial vapors.



A large bell-shaped cover, called *capellina*, is now hoisted up, and carefully lowered over the *pina*, by means of pulleys. A strong lute of ashes, saltierra, and lama is applied to its lower edge, and made to fit very closely to the plate on which the base stands. A wall of fire-bricks is then built loosely round the capellina, and this space is filled with burning charcoal, which is thrice replenished, to keep it burning all night. After the heat has been applied 20 hours, the bricks and ashes are removed, the luting broken, and the capellina hoisted up. The burned silver is then found in a hard mass, which is broken up, weighed, and carried to the casting-house, to be formed into bars of about 1080 ounces each. The loss of silver in burning, is about 5 ounces to each bar (*barra*), and the loss of quicksilver, from 2½ upon the good metals, to 9 upon the coarse.

The silver mine of Jesus Maria de Vallecillo is situated near the Rio Grande, in the State of New Leon, Mexico. It had a considerable reputation for the richness and abundance of its metals in the early part of the present century. It consists of two veins which run parallel to each other from northeast to southwest, at the distance of about fifty feet apart, near the surface, and a dip of about 45 degrees to the north. These are called the Old and New Veins. The old one, situated farthest to the south, was worked during the past century, but with what success there appears to be no authentic records left. The old vein only makes its appearance by cropping out upon the surface, and may be traced for some distance. The new vein was only discovered by sinking a shaft with the view of cutting the old vein at the depth of 300 feet. The new vein was thus discovered, and cut at the depth of 160 feet. This work was done by a company of old Spaniards, about the year 1820. They had been working this new vein but a few months, when they were expelled from the country. The mine was abandoned, and filled with water.

At the close of the late war with Mexico, a company of Americans became the owners, and undertook to restore the mine. After much time and expense in procuring and transporting to it a steam engine, and all necessary apparatus for draining the mine,

machinery, reservoirs, pumps, etc., they failed to prosecute the work to any practical result, and sold to the Vallecillo Company. Since that time, the work in restoring the mine has been quietly and successfully prosecuted. The *labors*, or drifts, have been cleaned out, as well as the main shaft, of all the rubbish that had fallen in and accumulated during thirty years.

On reaching the fronts where the Spaniards left off working, the ore was found in a strong and regularly developed vein. So satisfied was this company with the developments of their mine, that they ceased taking out ore and commenced putting their mine in a condition for efficient operations with extensive and varied outworks for the proper reduction of ores, forming all the complements of a *hacienda*.

An analysis of the ores was made by Dr. Louis Posselt, formerly a Professor of Chemistry in the University of Heidelberg during the last year, whose report presents the following statements:

REPORT OF DR. POSSELT.

To form a fair judgment of the ores produced by this mine up to the present date, it must be remembered that they were taken out under very unfavorable circumstances, the mine being in a bad state of ventilation, in consequence of which the labor had to be performed in bad light, so that it was impossible to separate well the different classes of ores, and keep them free from rock (tepetate), which, of course, diminished the average richness of the mass taken out.

The ores now above ground are of a various nature; but they can be divided into three principal classes, based upon their composition and the operation they require to bring out the silver.

First, The principal class are the metals called the "*colorados—colored*," comprising, at least, four fifths of all the ores extracted from the mine. They are highly interesting, not only for their abundance, richness, and the facility with which the silver can be extracted, but, also, for their chemical and mineralogical composition. They consist of a clayish and limy rock, colored by the *hydrate* oxides of iron, and more or less impregnated with the chlorides and bromides of silver (*plata verde*—green silver), and some double salts containing copper and silver (*plata azul*—blue silver). Besides these, there occurs through the mass, a lead mineral, consisting of sulphates, sulphurets, and carbonate of lead, containing silver, partly in globular masses of different sizes, and partly intimately diffused throughout the whole mass. Their richness in silver, of course, differs very much: but, by a proper and careful separation, they may be arranged in different and distinct classes.

The poorest, called "*azogues ordinarios*," are of a light reddish

color, very clayey, and so soft that they offer very little resistance in being ground to a fine powder. The quantity of silver they contain varies from three and a half to six ounces of silver to the carga of three hundred pounds. They are very easily concentrated by washing, in consequence of their clayey nature, and will then be ready to be "benefited" in the same way as the other richer varieties of the same class of metals. They can also be benefited in the common Mexican manner, "*beneficio del patio*," and the only disadvantage they then offer is the large number of grinding mills they then require. By working the mine in the mode hereafter to be stated, they may be extracted in almost any quantity, considering their abundance below, and thus they become of the greatest importance in regard to the production of silver.

The "*azogues comunes*," or better kind, are nearly of the same nature, only of a redder iron color, and a little harder; they contain from six to sixteen ounces of silver to the carga of three hundred pounds, but offer particular difficulties to the "*beneficio del patio*" on account of the lead metal they contain, intimately diffused through the mass; and I convinced myself, by experiment, that the loss of both silver and quicksilver would be too heavy for this mode of "beneficio" or extraction. For this reason they must be first passed through the copper kettle, *cazo*, by which process several advantages are obtained. All the silver existing in them—as finely divided *plata verde*, green silver—is obtained at once in the space of two days after being out of the mine, without loss of quicksilver, and with very little expense. Through the washing process occurring in the "*beneficio del cazo*," the greater portion of the lead metal is separated from the clayish part, *lama*, which then contains only the bigger grains of *plata verde*, green silver, and is well fitted to be passed through the *patio*. The heavy lead metal and some pyrites of iron remain in the *amalgam*, from which they are separated by washing, and afterwards easily benefited by the lead bath *gelemy*—smelting process. In this way all the silver will be obtained at a comparatively low expense, and the greatest part very quickly. Nine cargas of this kind, 11 oz. the carga, have been ground and passed through the cazo, copper kettle, and yielded 216 oz. of dry amalgam, and 60 oz. of pure silver. The loss of quicksilver was 30 oz. or 4 oz. per *marco* of nine dollars, which loss will be considerably reduced in future in consequence of the employment of the new, large cazo, and of better washing accommodations. Thirty-nine ounces of silver were contained in the residuum, which will be obtained at a trifling expense by the above-mentioned mode, because no grinding, neither any other expensive operation, is further needed.

The metal containing from two to five *marcos* per carga of

300 lbs., called "*azogues del cazo,*" *second class*, is much less clayish, being of a more limy constitution, including *calcspar*, *bitter spar*, crystals of quartz, brown ironstone, &c., is harder to grind, and fills, sometimes, the whole space of the vein; at other times, occurring in globules or irregular masses in the poorer parts of it. Six cargas of this class of five marcos, or $45 to the 300 lbs., have been ground and passed through the *cazo*, and they yielded 504 oz. of dry amalgam, corresponding to 23 per carga, 116 oz. of pure silver. The loss of quicksilver was about 56 oz., or nearly the same as in the preceding experiment, and is due to the same circumstances. The whole quantity of silver contained in the ore, was 144 oz.—extracted 116 oz.—the residuum of 38 oz. in the ore, is to be got out by the same process already described. These ores are more advantageous for the cazo than the poorer ones, because they contain comparatively more silver, *plata verde*, and less lead metal, *plomoso*, for which reason they yield a much larger proportion of all the silver they contain.

The *first* class of ores, "*azogues del cazo, primera clase,*" containing more than five marcos, or $45 to the 300 lbs., is at present only found in globular conglomerates of varying size, between the other metals; but it is probable, by working the mine deeper, there will be found parts of the vein yielding large quantities of this metal. They are only distinguished from the former class by the frequency and richness of the *plata verde* (green silver), and *plata azul* (blue silver), occurring in them.

Second in quantity and interest is a black ore, completely different from the preceding ores in composition. It is a clay, colored through charcoal, including pyrites of iron; and in the richer varieties consisting almost wholly of this and similar minerals, such as pyrites of arsenic, including sulphuret of silver, and metallic silver more or less mixed with lead metal, and frequently in a state of complete decomposition, so that it is difficult to recognize their original nature. The yield of silver by this ore varies very extensively, ranging from one to sixty *marcos* per carga; i. e., from ten to five hundred dollars to the 300 lbs. of ore.

Almost all now above ground contains one *marc* to 12 oz. per carga; a small quantity contains from 3 to 4 *marcs*, and specimens, showing a regular formation, from the lower portions of the mine, show sixty *marcs*, or more than one dollar and a half per pound.

It is to be expected that this metal will become of much interest and value, inasmuch as the extraction on the last trial was considerable, and its richness augmenting.

Third.—The third class of ore now obtained is a lead one, occurring, like the last, partly in globular masses between the other ores, and partly filling, in a more or less constant way, the

whole body of the vein. Its yield of silver is very uniform, amounting to 3 or 4 *marcs* per carga. Its appearance varies, some being in its original state of sulphuret of lead, others being decomposed in sulphate, carbonate, phosphate, arseniate, &c., &c., of lead. Its *beneficio* is a very simple one, by the common *galeme* smelting.

The production of the above-described ores can be pushed on to a large extent, as will be seen from the following description of the mine; and by fixing the "*hacienda del beneficio*" (establishment for reducing ores), so as to enable it to beneficiate large quantities of every kind of ore, and by finishing the new shaft in the mine, a mining district will be created equal, if not surpassing, the old and famous districts of the interior of the Republic.

The silver mine of Jesus Maria, near Vallecillo, is seen in two veins which traverse nearly in parallel lines the old Alpine, of which consists the predominating formation of the country. The thickness of the veins varies, of course, in different places, but they are remarkable for their constancy, varying but little from one yard in width—the minerals filling the veins are principally *calcareous spar*, *bitter spar*, *quartz*, *crystal of rock*, impregnated with, and often replaced by, the *oxydo-hydrates of iron*,—*sulphuret* and *sulphate*, and other salts of lead; *sulphuret*, *chloride*, and *bromide* of *silver*, often combined with *arseniate* and *carbonate* of copper, hornblende, and other minerals. The body of the vein is so soft that it opposes very little obstacle to the extraction of the ore; and the whole working can be done without the necessity of employing gunpowder, and yields larger quantities of ore than most of the other mines of the country.

Although the depth of the mine reaches not to the zone generally regarded in Mexico as the most metalliferous in ore, being only 80 yards deep, there are produced ores of a richness and abundance which *gave the absolute certainty* of great returns for the capital invested, and promise, by going further down, and reaching the depth experience has proved to be the richest in silver, a reward surpassing even the most sanguine expectations. But to accomplish this, the mine must be put in a state of better ventilation, by sinking a new shaft, and so establishing a current of air, which will allow the works to be pushed with great vigor, and facilitate the separation of the ores obtained in the different drifts.

This work is now in operation, and through it a new mine will be obtained, by multiplying the labors or drifts, so allowing to increase the extraction of ores to any desired amount. To secure a great production of silver, and large returns for invested capital, it is only necessary to carry on the extraction of the metal and its reduction on an extensive scale. The whole mineral region of this part of the country may be called a virgin one; and, by working vigorously, a mine can be obtained, in richness and

permanency not yielding rank to any in Mexico, and lasting for generations, as in the case of the mines of Catorce, Estado de San Luis Potosi.

LOUIS POSSELT.

ART. III.—THE COAL FIELDS OF BRISTOL COUNTY AND OF RHODE ISLAND. BY PRESIDENT E. HITCHCOCK.*

IN my reports on the Geology of Massachusetts, I described a large tract in Bristol county, a part of Plymouth county, the whole of the island of Rhode Island, and a strip on the west side of Narraganset Bay, as underlaid by graywacke, a rock older than the coal formation, and equivalent to the Silurian and Cambrian strata of late geological writers. While publishing my Final Report, however, in 1840, I became satisfied that a part of this region was a true coal formation, and so marked it on the map. But I now advance a step farther, and maintain that the whole of this tract, embracing not less than five hundred square miles, is a genuine coal field, that has experienced more than usual metamorphic action.

The metamorphic action to which this deposit and the coal have been subject, is twofold: first, *mechanical*; secondly, *chemical*.

The mechanical force seems to have operated upon the strata containing the coal in a lateral direction, so as not only to raise them into a highly inclined position, but also to produce plaits, or folds, such as would be formed if several sheets of paper lying upon one another were taken into a man's hand, and by pressure on the opposite edges were crumpled so as to form ridges and hollows.

* * * * * *

This same effect has been produced upon the coal strata of Massachusetts and Rhode Island, as well as in the great Appalachian coal fields of Pennsylvania and Virginia. The miners are familiar with these irregularities, and they constitute some of the most serious difficulties with which they meet. In the mine of the Blackstone Coal Company, at Valley Falls, R. I., for instance, the bed, and the accompanying rocks, which for a considerable distance dip nearly 45° to the *northwest*, begin to curve so as at length to dip southeasterly.

In the Aquidneck mine, at the north end of Rhode Island, the bed of coal that has been worked, was in some places pinched up to a width of not more than one or two feet, while in other places it has a thickness of from ten to fifteen feet. I noticed

* From a Report to the Governor of Massachusetts, dated Feb. 23, 1853, and Silliman's Journal.

here also, another peculiarity, which it is difficult to describe intelligibly without drawings. It is this: that the foldings do not run either perpendicular or parallel to the strike (direction) of the strata, but obliquely. Hence, when a thick mass of coal is reached, it passes into the earth between the strata in an oblique direction, and other expansions (as well as the contractions) of the bed, will run parallel to it. This fact will be of some practical value, but, perhaps, its chief interest lies in its scientific bearings.

Another effect of this plicating force has been to crush the coal, so that when dug out, it crumbles too much, and produces a great deal of fine coal. Sometimes the coal appears as if it had been severely squeezed and made to slide along between the strata. I find it to be a common impression among those familiar with these mines, that the force came from the northwest. But in the Aquidneck mine, the direction of the folds (somewhat southeasterly,) would indicate a pressure either from the N. E. or S. W.

The chemical metamorphosis which these rocks have experienced consists mainly in such effects as heat would produce. By an inspection of the map appended, it will be seen that this coal basin is in a great measure surrounded by unstratified rocks, such as granite and syenite,—which all geologists now admit to have been once melted. I have never seen any example in which they have sent veins into the coal strata: a fact that seems to indicate that the latter were not deposited till after the granite and syenite were partially cooled. Yet along the margin of this coal field, especially at Newport, all along the west shore of Narraganset Bay, at Smithfield, Cumberland, Wrentham, Bellingham, &c., we find the slates very much metamorphosed, so as only heat could have done it. I infer, therefore, that these slates were deposited while great heat yet existed in the subjacent unstratified rocks; and although the coal strata may be newer than the metamorphic slates, yet they also show a greater degree of induration, and in some instances more of crystallization than is common in undisturbed coal fields; and cross seams, or divisional structures, are also more common than usual. These too, are now usually referred to the action of heat. The coal, also, from this basin, has a greater specific gravity than most anthracite; bearing a proportion to the Pennsylvania anthracite, of 1·75 to 1·55. It has a tendency greater than usual, to break into cuboidal fragments, and has more the shining aspect of crystalline minerals. I ought to add, that in some of the mines, the metamorphic action has been so great as to obliterate all traces of organic remains. This is so remarkably the case at a coal bed, seven feet thick, in Worcester, that no trace of a vegetable has to my knowledge ever been discovered there, and the anthracite has a still more stone-like aspect, is heavier than that from Rhode Island, and is partially

converted into plumbago. Yet, even this, most geologists would not hesitate to pronounce a genuine coal formation.

Such are the chief circumstances that have so long perplexed the geologists in respect to the age of the coal of Rhode Island and Massachusetts, and made them hesitate whether to regard its age as precisely equivalent to that of the regular coal formation. But at length the evidence is too strong to resist, that this deposit belongs to a true coal field, and is of the same age as the great coal deposits in our own country in Pennsylvania, Virginia, Ohio, Michigan, Illinois, and Iowa, and those of England, Scotland, France, and Belgium. The only difference seems to be, that this is a metamorphic coal field.

Such an identification of this deposit is a point of great importance in forming a judgment of its value, and it therefore seems desirable that the evidence should be presented. This will involve a description of all the important facts with which I have become acquainted respecting this coal field.

I. *In the first place, the general outline of the surface over this field, corresponds with that of a regular coal field, or basin.* It is generally nearly level, save some gentle swells and a few outliers of rock, the remnants of former more extensive masses. On its margin the older and more crystalline rocks rise higher, though not very much so; for there is reason to think that both the margin and the surface of the coal field have been subject to powerful denudation.

By this argument I intend merely to show that there is no improbability in the supposition, that this basin of five hundred square miles may be a coal field; just because it looks like one. But the argument has no great force; because other deposits may exhibit a similar surface. Strictly speaking, it merely shows that the surface is underlaid by one formation, or by closely allied formations.

II. *The rocks correspond essentially to those of the coal measures.* The predominant varieties are four: 1. A dark colored slate, or slaty clay, often much indurated, and more or less charged with carbon, lying in immediate contact with the coal, especially beneath it. Its surface is sometimes highly glazed, as if by heat, or friction. I noticed fine specimens at the Roger Wiliams Mine, a mile or two north of Valley Falls, Rhode Island. 2. A coarse light gray grit, or sandstone, lying, so far as I have observed, immediately above the coal beds, and easily disintegrating at the surface. 3. A dark gray, hard grit, or sandstone: a much more extensive rock, forming in fact the principal one between the beds of coal, and in some places embracing coal without the intervention of shale. 4. A coarse gray conglomerate, which probably underlies the other rocks above described, and may

be the equivalent of the millstone girt that forms the basis of other coal fields. I do not feel satisfied, however, that such is always the position of this rock. Further examination is needed. This rock occurs in various places along the eastern part of Massachusetts, but nowhere, that I know of, associated with coal, save in the Bristol coal field.

Several other varieties of rocks exist on the borders of this coal field, but whether they are the coal measures metamorphosed, or older rocks, such as the Devonian and Silurian, is not certainly known. They consist of gray and red slates, and red sandstones and conglomerates. As to the red varieties, I have little doubt but that they belong to the Devonian or old red sandstone system, and have accordingly so represented them where they are most fully developed, viz., in Wrentham and Attleborough. In the south part of the former town, this red rock forms a striking feature in the landscape. I found it there, by the Aneroid barometer, to rise about four hundred feet above the general surface of the Mansfield coal mines, and three hundred feet above the excavation once made in Wrentham for coal. On this hill I found the red rock to have a strike E. 10° N., and a dip 70° southerly; so that it must pass beneath the coal field, as we should expect if it were the old red sandstone. A mile south of the meeting-house in North Attleborough, however, where this red rock (here mostly a conglomerate) shows itself, the strike is E. 15° N., and the dip 35° northerly. This fact looks as if we might here be on the southern border of a coal basin, and at Wrentham on the northern border, and that there may be an axis of the older rocks running northeasterly across the field. But this point needs further examination, and I have not given such a view of the matter on the,map. But I thought it best to indicate the region where I have seen the old red sandstone, as I presume to call it, most fully developed.

Now, setting aside these border rocks, and looking only at those in connection with the coal, I think we cannot hesitate to identify them with those of other coal fields; though, perhaps, in Massachusetts and Rhode Island rather more metamorphosed than is common.

III. *The number, position, strike, dip, and general character, of the beds of coal, already discovered in the district under consideration, render it probable that it is all one coal field, or essentially one.*

Under this head I am led to describe briefly all the coal beds in this deposit known to me, most of which have been explored to a greater or less extent. I have visited them all, with one or two exceptions of no consequence; and descended into all the mines that are accessible.

1. *Beds of coal in Mansfield.*—These have been opened in two parts of the town. One is near the centre, where a shaft was sunk by the Mansfield Coal Company, some fifteen years ago, sixty-four feet; but only a little coal was found.

About the same time, the Mansfield Mining Company sunk a shaft eighty-four feet near the Hardon farm, two miles southwest of the centre. A drift was then carried across the strata, and it is said that seven beds, of various thickness, up to ten feet, were found. Dip of these beds, 53° N. W. Strike, S. W. and N. E.

More recently, in 1848, I believe, the Mansfield Coal and Mining Company, through the enterprise and perseverance of B. F. Sawyer, Esq., sunk a shaft near the same place, one hundred and seventy feet, and ten feet in diameter: from which, according to the statements of Thomas S. Ridgway, Esq., the engineer, they have carried a south tunnel six hundred and sixty feet, and other tunnels and gangways to about the same amount. Not less than thirteen beds of coal have been crossed, but none of them thick. They are very irregular, sometimes swelling out to six or eight feet in thickness, and then pinched up to a few inches. The dip varies from 30° to 70° N. W., and the strike is nearly N. E. and S. W. Although these excavations are not far from the old Hardon mine, the beds are said to have little correspondence.

2. *Bed in Foxborough.*—This is only about two miles from the Mansfield beds, and two excavations were made there several years ago, and good coal obtained; but the pits are filled up so that I could not ascertain the strike, dip, and width of the bed.

3. *Beds in Wrentham.*—In the south part of the town, a pit was sunk many years ago, about one hundred and eighty feet, mostly in dark carbonaceous slate, and several beds found. The coal which I have seen from this spot is not good, having forty per cent. of ash. Strike of the bed, nearly E. and W.; dip, 45° N.

4. *In Raynham.*—An outcrop of coal appears in this town, about three feet thick, which has not been explored, except a few feet. Strike, N. 50° E., dip, 45° S. E.

5. *In Bridgewater.*—Indications of coal were shown me from the rock thrown up in digging a well in the south part of the town, but nothing further could be learned.

6. *In Taunton.*—Two miles northwest of the town, a similar opening was shown me, but I could not learn the dip and direction of the slate. Four miles to the west of the town, I was told that similar indications existed. The same is true of West Bridgewater; and in Berkley coal plants are found, such as usually accompany beds of coal.

7. *In Cumberland, Rhode Island.*—This is called the Roger Williams Mine, which was opened many years ago; but the works were burnt, and the explorations abandoned. But they

have been resumed within a few years, under the superintendence of Capt. Thomas Martin. A shaft has been sunk, three hundred feet perpendicularly, into which I descended, with Capt. Martin. The old bed, whose strike was nearly N. E. and S. W., has been abandoned, and by carrying a horizontal drift two hundred and sixty feet, a new bed was struck, which, at the place, runs nearly N. and S., and dips west about 45°. The average width was stated to be fifteen feet, and in some places twenty-three feet. If this be not a mere protuberant mass, occasioned by lateral pressure, it indicates a larger amount of coal than I have seen in any other mines in this coal field.

8. *The Valley Falls Mine.*—This is scarcely more than a mile south from the Roger Williams Mine: yet the strike of the beds will not allow us to suppose them connnected. The operations here are carried on by the Blackstone Coal Company. A shaft is carried down, which follows a bed of coal, with dip near the surface of 30° to 45°. This bed, which I examined several years ago, to the depth of about fifty feet, exposed a thickness of coal from six to nine feet, and the direction was N. 50° to 60° E. Since that time, the "incline," as the miners call it, has been pushed downward five hundred feet, or about three hundred and seventy-five feet of perpendicular depth, and, as already mentioned, the strata have been found to curve very much, and not less than five beds of coal have been crossed; the best having a width of six feet. One nest of coal was found thirty feet square.

9. *In Seekonk.*—I am informed by J. N. Bolles, Esq., of Providence, that the outcrop of a bed of coal was found in digging a well in this place, only fifteen feet from the surface. Its quality was similar to that found at Valley Falls. In the same region occur very fine specimens of coal plants, especially Calamites.

10. *In Providence.*—The same gentleman, in boring for water, in the north part of Providence, at the depth of sixty feet, struck a bed of coal dipping N. E. 45°, which is ten feet thick, and of the same general character as that at Valley Falls, which is known to burn well.

11. *In Cranston, R. Island.*—This town is on the west side of Narraganset Bay, along which the coal rocks extend as far as Warwick. In Cranston, according to Dr. C. T. Jackson, "slate, graphite, and impure anthracite," are found in an excavation seven or eight feet deep. Coal plants are very abundant on Warwick Neck; but no coal has been found.

12. *In Bristol, R. I.*—The coal bed in this place is in the west part of the town, and the spot where it crops out is only a few feet above the harbor. It was discovered in sinking a large well. Although I descended into it, I could not ascertain the thickness of the bed, nor with accuracy its strike and dip. Ap-

proximately it runs N. a few degrees E., and dips westerly about 48°. The coal did not appear to me to be as much crushed as in some mines, and seems of an excellent quality.

13. *Portsmouth Mine, or Case's Mine, in Rhode Island.*—This mine, situated in the northeast part of the island of Rhode Island, was opened in 1808, which was earlier than the Pennsylvania mines were explored. At that time the mode of burning anthracite was not known, and the coal was not sought after, and the work was abandoned in 1813 or 1814. Some years afterwards it was resumed, and in 1827, according to Mr. Clowes, the agent, twenty men and five boys raised about forty-four hundred tons of coal, coarse and fine. But the work was again abandoned not long after, and not resumed till 1847, when the mine was opened by the Portsmouth Coal Company, which has also ceased operations there. Mr. Barbour speaks of the amount of coal and rock, "principally the former," that has been excavated at this place, as about one hundred thousand tons.

Three beds were discovered at this place, "all of workable width." Dr. C. T. Jackson says that the bed last wrought was thirteen feet thick. He states its strike to be S. 80°, W. and N. 80° E.; dip 35° southeasterly. Mr. Clowes, however, says that the beds run N. E. and S. W., and dip from 40° to 90° southeast. As the mine is now unwrought, I could not settle these points.

14. *The Aquidneck Mine.*—This is in Portsmouth, and only about two miles west of Case's mine. Indeed there is reason to suppose, that while the latter occupies the northeast side, the former is situated upon the northwest side of the same coal basin. The strike of the strata and coal beds is N. a few degrees E., and the dip of the bed now wrought, varies from 28° to 35° S. E. Three beds of coal occur, only one of which has been wrought by the Aquidneck Coal Company, which bed, I was told, varied in width from two to twenty feet. They have followed down the middle bed to the depth of six hundred and twenty feet, from which six gangways have been extended, from eighty to eight hundred and forty-four feet each. During the last half of 1851, thirty-one hundred tons of coal were taken out, and an opening is now made into a subjacent bed. The appearance of the operations at this time, under the superintendence of Arad Gilbert, Esq., and the quality of the coal, appeared to me more satisfactory and promising than at any other mine in this coal field.

The mouth of this mine is not more than twenty feet above the ocean, and only a few rods distant; yet, after descending about one-third of the distance, to the bottom of the inclined shaft, I found the mine quite dry, although at the bottom, I was some hundreds of feet below the waters. The coal appeared to

me less crushed at this mine than at most others; yet the bed is very unequal in width; showing that the folding agency has here operated.

The opening of this mine is several hundred feet lower than that of the Case mine. The latter, however, I have understood to be subject to the influx of water, but I cannot learn how deep it was ever wrought. I consider the question whether these two mines are opened on the same bed, as yet quite unsettled. Both of them lie near to protruding mines of granite, and have been subject to a good deal of disturbance.

15. *In Newport, R. Island.*—In the southeast part of this town a thin bed of coal shows itself on the coast, where the dark strata of slate stand nearly perpendicular, and have a direction nearly east and west. During the revolutionary war, the British made some excavations at this spot, in the hope of finding fuel. But the prospect is very poor, especially as the spot is so near granite, which has affected the strata. Yet at this place the shale abounds in coal plants.

Let me now present, in a tabular form, the leading facts respecting these fifteen localities, where coal has been discovered in this field; at least in those cases where the facts are definite enough to tabulate.

LOCALITY.	NO. OF BEDS.	THICKNESS OF DO.	STRIKE OF DO.	DIP.
Mansfield, Centre, .	1	A few inches,	N.E. and S.W.,	N.W., large.
" Hardon, .	7	10 feet,	N.E. and S.W.,	58° N.W.
" New, . .	13	7 feet max.,	N.E. and S.W.,	30° to 70° N.W.
Wrentham, . . .	1	– –	E. and W.,	45° N.
Raynham, ...	1	3 feet,	N. 50° E.,	45° S.E.
Cumberland, . . .	2	15 to 23 feet,	N.E. & S.W. & N. & S.,	45° W.
Valley Falls, . . .	5	6 to 9 feet,	N. 50° to 60° E.,	30° to 45°
Providence, . . .	1	10 feet,	N.W. and S.E.,	45° N.E.
Bristol, ...	1	– –	N. somewhat E.,	48° N.W.
Portsmouth, Case's,	3	13 feet max.,	N.E. and S.W.,	40° to 90° S.E.
" Aquidneck,	3	2 to 20 feet,	N. a few degr's E.,	28° to 35° S.E.

The geologist will notice two circumstances of importance in the preceding facts; one is, that there is a tendency to a northeast and southwest direction in the beds of coal. The other is, that where horizontal drifts of any considerable extent have been carried across the strata, several beds have been crossed. The exceptions in the dip can easily be explained by the proximity of the older crystalline rocks, which may have greatly changed the direction, at least for some distance; and the opposite dips observable in some cases, may be referred to the same cause, or perhaps to an anticlinal axis of older rocks, which I have some reason to suspect, may cross this coal field in a N. E. and S. W. direction.

It seems to me difficult to avoid the conclusion, that these different beds, scattered as they are so widely, all belong to one and the same coal field; although denudation or vertical movements may have rendered some parts of it much less productive than others. The strike and dip, as well as the number of beds, correspond as well to other coal fields as we ought to expect, when we consider the great amount of metamorphic action which has here been exhibited.

It ought to be known, too, in this connection, that this region is densely covered by accumulations of drift, and the sand and gravel of ancient sea beds. Especially is this the case where the rock is softest—that is, the black shale,—which contains the coal beds. Hence rocks rarely show themselves at the surface, and the wonder is, that so many beds of coal have been discovered, rather than that no more have been found. The digging of wells and other excavations have been the principal means of bringing them to light, nor will any reasonable man doubt that probably many more are concealed beneath so thick a coating of drifted materials.

IV. *The character of the vegetable remains found in connection with these coal beds, make it almost certain that they belong to the coal measures of the carboniferous system.*

[Figures of species of Stigmaria, Calamites, Pachypteris or Odontopteris, and Neuropteris, on two plates, are here referred to.]

I might add several other species of plants peculiar to the coal formation, and found in this field. But it seems to me unnecessary. Those already exhibited appear to settle the question as to the true place of these deposits, in the geological scale. No geologist would think of putting them in any other part of the series than the carboniferous. I have not, indeed, met with any specimens in these rocks, of Sigillaria and Lepidodendra, which are common in the coal rocks of Pennsylvania and Ohio. But it is more easy to explain their absence from a real coal field, than the presence of so many other plants, identical with those of the coal measures, in any other formation.

In view of all these proofs I am led to the inference that this is a genuine coal field of the carboniferous series. And the tendency to a northeast and southwest direction in the beds, as well as the high dip, leads strongly to the conclusion, that this is only a detached portion of the great Appalachian Coal Field, which stretches through the Middle States.

In comparing the character of this deposit with those of European coal fields, I am led to regard it as very similar to the *Upper Culm Measures* in Devonshire in England. These are composed of "sandstones and indurated shales (the latter contain-

ing the Culm or Anthracite), and are of great but unascertained thickness, being perpetually interrupted, coiled upon themselves, and repeated over again, forming an incredible number of anticlinal and synclinal lines." (*Ansted.*) A considerable number of beds of coal occur in these rocks which are several feet thick, and they are more or less extensively wrought. Only a few years ago, some of the ablest English geologists (De la Beche and others) contended that these rocks were not true coal measures, but considerably lower in the series. Yet I believe they are now universally regarded as belonging to the carboniferous system, and on the same evidence as I have just adduced, viz., the organic remains. The Devonshire beds seem to be more changed by metamorphic action than those of the Bristol coal field, if we may judge from the fact, that the vegetable impressions are more distinct here than in England.

In Brittany, Normandy, le Maine, and Anjou, in France, according to the French geologists, analogous rocks occur, containing beds of anthracite more than three feet thick. And though referred by some to the graywacke strata, they are at last taking their place in the true carboniferous system, as are also the anthracite strata of the Alps, which have been regarded as newer than the coal formation. (*See Quarterly Journal of Geology for August*, 1851, p. 91.)

The evidence, then, seems very strong, on which I base the conclusion that the Bristol and Rhode Island deposits, with vegetable remains, possess the age and characters of a true coal field as the carboniferous period of the geologists. And if it be indeed so, much greater confidence of success may be entertained in the researches after coal, which have for some years been making, than if we could assign no settled place to the rock, or that place were higher or lower than the carboniferous system. * * *

Art. IV.—REPORT ON THE SUMNER, HIPP, FULWOOD AND LEMONS MINES OF NORTH CAROLINA. By Professor Charles Upham Shepard.

The mines here described are situated in the counties of Mecklenberg and Union, in North Carolina. They are briefly enumerated in the accompanying printed schedule, entitled "Condensed Description and Statement from Pamphlet published in 1835," &c. Those situated in Mecklenberg will be treated of first.

1. Sumner's Mine.—This mine is located in the granite country, six miles west by north of the town of Charlotte, with which place it will soon be connected for nearly the entire dis-

tance by a plank road, now in the course of construction. It is upon a tract of ten acres in extent, of an oblong figure, having its greatest length in the direction of the vein, which traverses the whole extent of the lot, in a course by the compass, of N. 30° W. and S. 30° E. The region constitutes a portion of an extensive swell of land with an expanded plane surface, and is traversed at its northern and on its western side by a small run of water, whose level is from 40 to 50 feet below the general outcrop of the vein. This has only been opened for 120 yards at the northern end, thus leaving 200 yards of its extent wholly unexplored. Of its continuity, however, there can be no doubt, inasmuch as the vein, apparently, has been opened on the adjoining lands of Mr. Cathy, at the distance of about a quarter of a mile from the present openings in the Sumner Mine. It may be mentioned, likewise, that the vein appears to be prolonged from its northern end, and to form a mine now worked under the name of the Carson or McClure Mine.

Although the Sumner Mine has for several years been in a neglected condition, it still exhibits to advantage the dimensions and general character of the vein. It is one of strongly marked features. It is not vertical, but pitches to the east at an angle of 80°. It has a core of cellular quartz of from fourteen inches to three feet in thickness, with several feet of soft slaty clay on each side. The latter is so soft as to be penetrated any where with a shovel. In many places it has only the consistence of tallow. It is more or less stained of a brown and yellow color by the hydrated peroxide of iron. I gathered average specimens from the quartz rib and the adjoining soft slate, which, on examination since my return to this city, have afforded me a very decided yield of gold; but I am aware that nothing which could now be collected from the surface of such veins would afford a safe criterion of the value of the mine. In the absence of fresh workings, which would uncover the vein for a considerable distance, I conceived that it would be useful to ascertain the previous history of the mine. I learned from Mr. Sumner, who at present has no interest in the property, that the greater part of the 120 yards of the vein at the north end had been more or less excavated and dug over from 15 to 25 feet in depth, with a width of from 6 to 7 feet. That the operators had found the best yield of gold in the soft brown clay on the west side of the vein, in a seam 6 or 7 inches in width. The quartz, as well as the soft clay on the under side of the vein, contained gold, but they had not the means of making its separation profitable. After removing the vein, the side walls were found to be firm enough to stand without the use of timbers. At the depth of 20 or 25 feet, they were unable to keep out the water, which finally led to the suspension of the explorations.

It is obvious that here is a well marked gold vein of the same general character with the celebrated Capp's Mine, from which so much gold has been raised, and which is situated at only a few miles distance from this spot. The Sumner Mine has already given enough of the precious metal to prove that it really is a mine. A few hundred dollars judiciously expended, would probably be in good part returned in the gold it would bring to light, and might establish the character of a rich repository of gold for the mine. If the improvements claimed to have been made of late in the amalgamating process should prove to be real, there cannot remain a doubt of the great value of this and the following mine.

2. THE HIPP MINE.—About four miles west by north of Sumner's Mine is situated the mine bearing this name. It is ten miles from Charlotte. It is situated upon a slight rise of land, having a northeast and southwest direction—the vein commencing, as at Sumner's Mine, in a small branch or creek, and extending up and along the hill for at least a quarter of a mile. The vein is a very roomy one, consisting of a central rib of carious quartz, 14 inches to two feet in thickness, with many feet of soft, decomposed, ferruginous slate on each side, and the whole embraced in a hornblendic or syenitic granite.

The vein has been sunk upon, more or less, for the entire extent of its outcrop. The pits or shafts are from 10 to 40 feet in depth, at which latter depth the water appears to have overpowered the feeble means of the operators.

Several small heaps of ore had lately been collected from the waste heaps of the mine, with the intention of having it ground for gold. In numerous specimens of these, the gold was distinctly visible, and the whole presented the aspect of an excellent ore. It abounded in a brownish black hydrated oxide of iron, among which iron pyrites, reddish quartz, and stains of copper were noticeable. The quartz among the ore of this mine is deeply colored by iron, and sometimes approaches chalcedony or agate in its character. My impression of the value of this mine was very favorable; and, as the testing of its richness will involve but little expense, I should certainly recommend it to the attention of some prudent and skilful adventurer in this class of mines. It is sure to pay all expenses, and may result in a brilliant disclosure, as actually happened in the exploration of the Capp's Mine, which, like the preceding mine, it strongly resembles.

A second location for gold occurs on an adjoining lot (ten acres in extent), having the superficial shape which is characteristic of these metalliferous deposits. A single opening of small extent was pointed out, amidst a profusion of quartz blocks, strewed over the surface. A quartz vein, *in place*, with its walls

or sides of talcy slate is visible; and gold has been obtained by the ordinary panning process. The ground slopes off rapidly to a contiguous creek, which will facilitate the proving of the vein. It is, moreover, on the course of the well known Hoover vein, which is situated on the adjoining tract, and from which it is only separated by the creek above referred to.

3. SMART AND FULWOOD MINES.—These mines are situated upon a very extensive tract, embracing 370 acres of well wooded land. In passing across it, I at once recognized it to belong to the same geological formation as the region of the celebrated Gold Hill, viz., to the talcose chlorite slate. The mines, unfortunately, are not in a condition to be viewed to advantage, having been out of work since 1839. I noticed, however, from the character of the pits and shafts upon the great vein, that its position is vertical, as at Gold Hill; and that, as at the latter place, it is free from thick masses of quartz, but rather has this mineral diffused through the slate in numerous thin parallel layers or bands. The vein varies from five to ten feet in width, and, according to Captain Penman, who formerly managed the mine, it sometimes spreads out to 20 feet and upward. The depth of the shafts cannot now be ascertained from inspection; but my impression is that the deepest one was down 120 feet. It is well known that excellent ore was raised from the mine. Mr. Elwood, an intelligent English miner, who worked under Capt. Penman, assured me that parties of adventurers continued for a long time after the mine was stopped to work over the sands, and to realize from them two dollars to the bushel; and, although the waste heaps had been subjected to repeated cullings for a series of years, I was still able to pick up specimens in which the gold was apparent to the *naked eye.* The existence also of a lateral and obliquely parallel vein of galena (sulphuret of lead), rich in gold, and which was not discovered until within a few years of the suspension of work at this locality, emphatically stamps this region with a mining character. This vein has been sunk upon at the distance of a quarter of a mile from the engine shaft of the gold vein, to the depth of 80 or 90 feet. It is evidently a true vein, cutting the strata obliquely, and deviating 20° from a vertical position. Its width is three feet, and it possesses very distinctly defined walls. According to Capt. Penman, it is divided into two portions by a thin band, or layer of slate, the quartz on one side being 14 inches thick and much interspersed with galena, that on the other side containing iron pyrites and gold, and having a width of two feet. I saw numerous lumps of the quartz containing the galena in the waste heaps. In some of these stones of several pounds weight one half of the mass was lead ore. An average sample of the galena was selected for assaying, which

gave me at the rate of 64 ounces of nearly pure gold to a ton of 2240 pounds of the metallic lead, which, in a large way, would not differ much from that amount of gold to a ton and a half of the ore. This is certainly a valuable ore. Both Captain Penman and Mr. Elwood agree that the quartz generally of the rest of the vein also is rich for gold.

The proximity of lead and gold veins at these mines may be held as a favorable omen, which, with the perfect identity of geological formation with the region of Gold Hill, where the greatest gold mine in the State is now working, enables me to say, with much confidence, that *here is a spot that will richly reward the outlay of capital.* Let it be remembered, also, that its early history has been similar to that of Gold Hill, where the ground was at first superficially mined, down to the undecomposed rock, and then abandoned for a number of years, until 1843; when the workings were resumed, and the veins followed down into the fresh unweathered rocks; since which time they have yielded at the rate of $150,000 per annum.

It would, of course, be unwise to count upon the same success at this spot as at Gold Hill. But let a company expend a few thousands upon these two veins, under the direction of a skilful miner, and there is no room to doubt but what they would speedily realize their outlay, and develope a lasting mine of both gold and lead.

4. Lemons' Mine.—This celebrated mine lies about four miles, in a northerly direction, from the Smart and Fulwood mines, and is situated in precisely the same formation. The vein traverses the central region of a long hill, which is nearly three quarters of a mile in length, with a breadth of about 80 rods. The trend of the hill is N.N.E. and S.S.W. On the southeasterly side of the hill runs a branch in which considerable gold has been found, and where the first discovery of this metal was made upwards of twenty years ago by Mr. Lemons, with whom I conversed upon the subject of the discovery and the subsequent working of the mine. It is proper to observe that Mr. Lemons has no interest in the mine, and that I found his history of it fully corroborated by other sources of information.

During a hot day in the spring of the year, Mr. Lemons was washing his hands in the waters of the branch above alluded to, when he discovered a piece of gold of the size of a grain of wheat. This led him to wash the sand at the spot by means of a rocker, which led to the discovery of a fragment worth $5, besides some smaller grains. He was then led to search fifty yards up the side of the hill at a place which had been designated by a man named Stephens, who professed to have been guided by the use of a divining rod. Mr. Lemons here pried up a small

stone on the surface, and, by washing a pan of the soil, found it rich in gold. This was the first idea they had ever obtained of the existence of gold in the country, except in the washings of streams. A specimen of gold was quickly picked up which was valued at $20. He extended his labors in the vicinity of this place, until at last getting fifty yards higher up the hill, he noticed a spot where the slate was deeply stained with iron and much seamed with little veins of quartz. He here worked a little, just at night, with very encouraging prospects, and resuming again the next morning, found a lump of gold, half as large as a goose egg, in which less than half the bulk was rocky matter. The next day (Saturday) he was obliged to break off to attend muster. On Monday he recommenced, and dug up three stones of gold (about one quarter of which was rock), which together weighed ten pounds. Assisted by his brother they continued their labors through the day, and raised together $3000 in value. On the succeeding day, the party of explorers was increased to six persons. They went down about three feet into a decomposing slate, and found, in half a day's work, fifty-six pounds weight in lumps of gold, one fifth of which only was rocky matter. They afterwards continued down sixteen feet, and there found a lump of a very splendid character as a specimen, sticking between the layers of slate, about as large as the two hands placed palm to palm. This was purchased by Mr. Henry Williams, of Charlotte, who also related to me the circumstance. He gave $1950 for the mass, and subsequently sold it at an advance of $300. It was said to have been disposed of afterwards in Paris for $3000. The mass was traversed by two layers of fibrous or comby white quartz.

Mr. Lemons then describes sinking to 35 feet, and cutting numerous little side tunnels four or five feet deep, but unattended with additional discoveries. Meanwhile a dispute arose respecting the title to the property, and for a time it was involved in the embarrassment of a lawsuit.

Seventeen years after (four years ago) a party of three commenced labors anew on the hill. They sunk a shaft close adjoining the original one of Lemons, this having caved in. They went down 20 feet, but without success. They then sank a second of the same depth, but on the opposite side of Lemons' shaft. This led to no discovery of gold. They then returned to their first excavation, and discovering a small "*gravel streak*" that ran about two feet distant from the quartz vein; they followed it horizontally 18 inches, when it began to get rich in gold, and at five or six feet further it enlarged and yielded a little more gold. It then contracted for four or five feet, when it enlarged as before, but yielded still better. They thus drifted on for thirty

feet, finding that the seam grew very rich every five to seven feet of their progress. A new shaft was now put down to the depth of 40 feet, when the seam suddenly gave them $2000 within a very narrow space. Continuing the drift in for eight or ten feet, they again took out $500, when, the water troubling them, they broke off, and sank a new shaft 83 feet in depth, and cut an inclined tunnel upward, toward their former veins, but finding no more rich bunches or pockets, the mine was a second time abandoned.

A horse-whinn and some other mining fixtures are still in a good state of preservation at the mine. I observed extensive heaps of slate at the mouth of the main shaft, in which I had no difficulty in detecting gold. One heap in particular, of about 200 bushels, had been selected with a view to grinding, and which is estimated to contain one dollar to the bushel. The slate is a compact, feldspathic stone, of a greenish or yellowish blue ground, and much stained by iron rust, and secured by imperfectly crystallized quartz, giving rise in the mine to what are called *gravel streaks*, and which are sometimes found rich in gold.

The idea of grinding slate which is worth but one dollar to the bushel, seems scarcely to have been entertained by those who operated the superficial workings above described. As the mine was found by picking up lumps of gold by the pound, as soon as it fell off in these magnificent returns it was, as a matter of course, abandoned; and still it is manifestly a rich deposit of gold, in a most tempting rock and locality for a permanent mine. One thousand dollars properly expended here would unquestionably establish its character to rank among the best mines in the country.

CHARLES UPHAM SHEPARD, M.D.
Prof. of Chemistry in Med. Col. of S. Carolina, and Mass. Prof. of Chemistry in Amherst College.

ART. V.—THE COST-BOOK SYSTEM, ITS PRINCIPLES AND PRACTICE.*

DURING the past four years, our columns have teemed with remarks and explanations on the real meaning to be conveyed by a statement that a mine was carried on under the "Cost-book System," with numerous proceedings in the law-courts bearing on the same subject; and, in many instances, to the best of our ability, we have endeavored minutely to define what really is the true basis of the system, how its several regulations are estab-

* London Mining Journal.

lished, and how they should be enforced. As, however, notwithstanding our attempts to render clear and intelligible this evidently misunderstood and misinterpreted mode of conducting a mining adventure, we are almost daily receiving communications of inquiry on various details connected with it; we have, therefore, collated the general information published in our columns; and, by an entire revision and rearrangement, we trust the present article will prove a certain and instructive reference to all who may at any time be at a loss in comprehending any of the details of at least the general principles on which the system is based. The "Cost-book System" of conducting the affairs of mines probably originated in Cornwall, has certainly prevailed there for centuries; and a main part of the business of the equity side of the Court of the Vice-Warden of the Stannaries consists in enforcing its rules and usages. In this Court judicial decisions have been given on many of the most important legal questions arising out of mining adventures, and illustrating the customs of the country. The system implies, that when a number of persons have determined to form a company for working a mine, they meet, and in a book called the "Cost-book," enter their names for the shares they intend to hold. They then decide what works shall be carried on, appoint mining agents to conduct the necessary operations, and the most important officer, (the "Purser,") whose duties are to keep the "Cost-book," and there enter the accounts of the mine, collect the amount due from shareholders, pay costs, &c.; and, in fact, this officer is supposed to represent the whole body of shareholders. The costs attending the adventure are fairly entered in the same book as they arise; and at stated intervals, usually every two months, the adventurers meet to audit the accounts, and transact other necessary business. If there is a profit, a dividend is either declared or the balance carried to the next account; if a loss, a further call is made sufficient to cover it, and proceed with the working; or, if considered desirable, the mine is abandoned, materials valued and sold, liabilities discharged, and surplus, if any, divided. In a mining adventure, properly carried on under the Cost-book System, any shareholder may, on giving notice, and paying his proportion of liability at the time, relinquish his shares, when he is entitled to his fair proportion of the value of the materials; and no adventurer need ever be ignorant of the financial state of the mine, all liabilities being settled at every two-monthly meeting. When thus conducted, the purser of a mine is enabled, by the laws of the Stannaries, to sue any adventurer, whether resident in or out of Cornwall, for his proportion of the costs, audited and signed by the adventurers at one of their meetings, by a petition to the Vice-Warden. This petition, when the defaulter resides in

Cornwall, is served on him personally; and when he resides out of the jurisdiction, the service is effected by affixing copies of the petition and the summons which accompanies it to the door of the account house, or other conspicuous place on the mine; and petitions of this kind are amongst the most numerous of the suits on the equity side of the Court. In commencing to work a mine on the Cost-book System, the rules and regulations should be first entered in the Cost-book, somewhat of the following character, which are similar to those of the first mines in Cornwall; of course any variations in detail may be made according as may be agreed at the meeting of adventurers.

"This mine is hereby declared to be divided into [ ] equal parts, or shares, and held respectively by the several parties whose names are subscribed hereunto.

"The system of management, and mode of carrying on the operations of the mine, and all matters attendant thereon, shall be enforced and carried out under the system generally known as the Cost-book System, and referred to in the Act Victoria 7 and 8, cap. 110, clause 63, subject to the following and any other special minutes or regulations that may hereafter be made for the internal government of the affairs of the mine, not inconsistent with the general management under the Cost-book System.

"1. That the accounts be made up monthly, and be discharged by the purser or agent employed for that purpose, who shall enter, or cause to be entered, the monthly cost-sheet, in a book to be kept for that purpose, to be denominated the "Cost-book," which this book is understood to be.

"2. That a meeting of the adventurers shall be held at the mine, or at some convenient place, to be appointed from time to time, at least once in every two months, when the accounts of the preceding two months, with the balance, and all matters appertaining to the financial affairs of the company shall be submitted, and minutes of the same entered into the Cost-book, and signed by the respective adventurers present. That a list of shareholders, or adventurers, shall also be prepared, and entered in the Cost-book, at such several meetings, and a statement submitted of the arrears, if any, of calls previously made.

"3. That at all such meetings, upon the inspection and approval of the accounts and vouchers, the adventurers present shall have full power to make any call, or calls, which may be necessary for the prosecution of the mine, so that the amount so called does not exceed the sum estimated for the cost of the succeeding two months, in addition to paying off any engagements or liabilities which may at the time exist; and may declare a dividend,

or division, of any surplus profit which may arise from working the mine.

"4. That at all such meetings, the adventurers present shall have full power to appoint or remove any agent, or agents, and to determine the rate of payment for services rendered.

"5. That all meetings shall be called by circular, addressed, by post, to the several shareholders, or adventurers, giving at least seven days' notice of the intended meeting; and that the same be signed by the purser, or his representative, or such party as the adventurers shall from time to time appoint.

"6. That at the meetings so held, the adventurers shall, if they think fit, appoint from time to time a committee of the adventurers, to superintend the management of the affairs of the mine, and to communicate with the purser, captain, or other agent, on the subject thereof; but the powers of such committee shall not extend beyond the period of two months, although the members of such committee will be eligible to be re-elected, or may be removed, and other persons appointed in their room.

"7. That any meeting may adjourn from time to time, as may be deemed expedient; but that it be imperative on the purser, or other agent duly appointed, to convene a meeting, at least once in every two months.

"8. That at all meetings such adventurers shall have one vote in respect of every single share held by him, and in respect of which all calls then due shall have been paid up; and that a majority of votes of those present in person, or by proxy, be binding on the adventurers, whether present or absent.

"9. That absent adventurers be entitled to vote by proxy—they deputing their powers to a co-adventurer; but that it shall be understood the proxy be confined to the specific meeting named, unless otherwise directly expressed.

"10. That all transfers, or assignments, of shares be entered in the cost-book, and signed by the respective parties; but in case of a transfer made by a separate paper, or instructions given to the purser, or other agent, by letter, such letter must bear the post-mark on the sheet authorizing the transfer, and not be inclosed in an envelope—and the original transfer shall be deposited with the purser, or other agent, and be by him entered in the cost-book.

"11. That the captain, or resident agent, make a report on the operations at the mine, at least once a fortnight, or more frequently, if deemed desirable, and that such report be open at all times to the inspection of the adventurers, on application to the purser, or other appointed agent.

"12. That a purser be appointed, into whose hands the moneys collected by calls on shares, and arising from the sales of ores, and otherwise, shall be paid.

"13. That a copy of the resolutions and abstract of accounts shall be transmitted to every adventurer, within seven days after the meeting shall have been held.

"14. That if any claim remain unpaid for the space of fourteen days after the time fixed for the payment of the same, the share in respect whereof it is due may, at any subsequent meeting of the adventurers, be declared to be forfeited absolutely, such meeting having been convened by circular, stating the object of such meeting.

"15. That any adventurer shall be at liberty to withdraw from the undertaking, on giving notice to the purser of such intention, and paying up his proportion of costs and liabilities: and further, that he be entitled to his like proportion of ores, machinery, cash in hand, &c., up to the period of such surrender of his interest in the mine.

"16. That the purser shall, when required by adventurers holding 50 shares in the undertaking, convene a special general meeting, for such purposes as may be stated in the requisition—the same being mentioned in the notice calling the meeting, and due notice given accordingly."

A mine conducted under such regulations, and divided into a certain number of shares, represents an equal number of votes. Every share represents one vote; and thus property is equally represented. Resolutions are not carried at meetings by show of hands, but by the number of shares; thus avoiding the possibility of the minority coercing the majority, and establishing the most fair and equal mode of conducting the management of property. While it would be superfluous to notice any one case particularly, among the many mines in prosperous working under the Cost-book System, we will select one case of a mine, which did not become profitable so soon as some of the adventurers expected, showing the advantages which accrued even in the breaking up of an undertaking. The St. Austell Consols Mine was commenced about 1844, and conducted strictly in accordance with the Cost-book Principle, and held out the most promising and favorable indications. After continuous and extensive working, without success, the mine was suspended; and a portion of the adventurers wishing to relinquish, the remainder consented, and measures were immediately taken to ascertain the amount of assets and liabilities. The position of the company was thus at once ascertained; and instead of liabilities being suffered to run on and increase, harassing actions by merchants against individuals for payment of stores commenced, a general breaking up of the concern taking place, and want of confidence engendered, the business was all smoothly arranged, and a proportion became payable to the relinquishers of 7*s.* or 8*s.* per share. In case of a

shareholder disposing of all or any part of his shares, he signs a notice to the purser that he has sold such shares to A. B., of ———, and who signs such notice, accepting such shares upon the same terms as the seller held them. It is then his duty to enter the name of the purchaser in the cost-book, and certify the same to the purchaser, by letter, when the liability of the seller immediately ceases to the extent of the shares so sold. It having been decided that the transfer requires no stamp, the purser supplies a printed form for the purpose. He also makes out a correct list of the shareholders, to lay before the adventurers at every two-monthly or other periodical meeting. In the case of Reynolds *v.* Basset, it was decided that no transfer could be legal unless the same was registered in the cost-book, and that the entry in the cost-book constitutes a complete transfer; and in the case of Ricketts and others *v.* Bennett and another, the judge observed that "the Cost-book Principle was distinguishable from other trading concerns or partnerships, so that no shareholder could pledge the credit of another shareholder;" thus clearly showing that there are no liabilities beyond the amount of shares respectively held by each shareholder up to the time of transfer; while the moment he transfers his shares, his liabilities cease—that this principle gives to each shareholder a vote in the direction of the affairs of the company at each of their meetings—and that the shareholders are not at all subject to the laws of common partnerships, or the Joint Stock Companies' Act.

As this case was of considerable importance, as showing how far the Cost-book System differs from the laws of common partnership, it will be well briefly to refer to it. It appeared that Mr. Robinson, the purser of Wheal Providence, drew sums from the Truro Bank to the amount of £3668, some portions of which he applied to the payment of dividends, although no profit had been made, and the remainder to his own use. The bankers, unable to obtain payment, sued Bennett and another (two of the adventurers); but Mr. Baron Platt decided, that in point of law, the fact of their being co-adventurers did not, of itself, authorize Mr. Robinson to borrow money for the purposes of the mine, of which they were ignorant, nor was it any ground on which their credit could be pledged for money borrowed. He considered the case *distinguishable from other trading concerns*, and did not see how the jury could have come to any other decision than the one at which they had arrived—viz., finding a verdict for the defendants.

This principle may be said to have originated when tin was the only metal known, or worked, in the counties of Cornwall and Devon, and was adopted by the tinners, or laborers, working in tin mines; who, unable to keep their own accounts, employed a

person for such purpose, by them denominated a "purser." He kept their accounts in what was denominated the "Cost-book," advanced them, from time to time, such money as they required, balanced up their accounts, and divided among them any profits which might have arisen, at the end of every two months. In process of time other parties than tinners, or laborers, embarked in mining pursuits, who were termed adventurers, or shareholders, and the purser, acting as agent for both parties, paid the dues to the "lords," dividing the profits among the adventurers. This led to the establishment of the Stannary Court, held every two months, for auditing the purser's accounts and settling any disputes which might arise between any of the parties connected with the mines. This court, however, did not extend beyond tin mines; and as copper mines became of consequence, and silver-lead mines were discovered, it became necessary to extend the authority of the court to those mines also; and, about the year 1834, an Act of Parliament was passed for the purpose of carrying out the rules of the Stannary Court. Courts of law and equity were established, under the jurisdiction of a judge, called the "Vice-Warden," the Prince of Wales being the Lord-Warden, to whom appeal can be made from the Vice-Warden's Court.

On summing up the general principles of the Cost-book System, it appears the direction and management of the mine are vested in the whole body of shareholders, who are not mere instruments in the hands of directors, the resolutions of the majority at their periodical meetings being acted upon. The power to act for the general interest is usually delegated to a committee of management, or to the purser; but neither of these parties has power to make calls, or perform other acts but such as are expressed in the regulations first laid down, or since altered or amended by general consent. Calls are made at general meetings, and every shareholder is liable for such calls upon his shares, whether he was present or not. If a shareholder neglects, or refuses to pay up his calls, the committee of management are empowered by a clause in the cost-book, to forfeit his share, subject to confirmation at a general meeting. Or any creditor on the mine can sue such defaulter for goods supplied to the mine—a mode of procedure generally productive of the most summary results, it being only necessary for the purser to supply the name, &c., to any merchant who is willing to sue him. The purser has also a good action against him in the Stannaries' Court. On the other hand, should any shareholder become dissatisfied with the adventure, he can, by giving notice, relinquish his shares, on paying his share of liabilities, when he is likewise entitled to his proportion of all the property, to be ascertained by valuation. Such

are the general principles which guide all companies acting under the Cost-book System; but the specific details and by-laws may differ according to circumstances.

Having thus, to some extent, shown what the system is, we will briefly advert to the localities in which it is considered to be available. The jurisdiction of the Stannary Courts is (and there cannot be two opinions on this subject) confined to the county of Cornwall; and we have ever contended (and nothing has ever been advanced to show that we are wrong), that these courts alone have power to interfere in the settlement of disputes between parties engaged in working mines under the Cost-book System, and, consequently, that in Cornwall alone does the law recognize the principle as differing from that of joint-stock companies and common partnerships. Notwithstanding these facts, the public are continually appealed to in prospectuses for carrying out all sorts of speculations in all parts of the kingdom, and even in foreign countries, under the Cost-book System. It is clear as the light of day that the whole are fallacies, and that, out of Cornwall, no such business partnership is known by the common or equity law of England. Even the adjoining mineral county of Devon must be considered beyond its jurisdiction, as, notwithstanding its proximity, it has ever been considered without the pale of the Cornish Stannaries, having had its own courts in ancient times, which have fallen into desuetude, and which, doubtless, might be legally and constitutionally reinstituted. Derbyshire had also, in ancient times, its local mining laws, which have likewise become generally a dead letter.

The Act of Parliament, 7 and 8 Victoria, cap. 100, commonly called the Joint-Stock Companies' Act, contains the following clause—"Provided always, and be it enacted, that nothing in this Act contained shall extend, or be construed to extend, to any partnership formed for the working of *mines, minerals, and quarries*, of what nature or kind soever, on the principle commonly called the Cost-book Principle." The Registrar, under this Act, has given his opinion, that this clause extended the principle beyond the boundaries of Cornwall, to all parts of the kingdom, but on what grounds we cannot conceive; it certainly does not extend the jurisdiction of the Stannary Courts; and it appears clearly to us that this was the only saving clause to prevent the provisions of the Act in question from being diverted from their intended operation, and made the tools of interference with the working of *Cornish mines, minerals, and quarries*, under the Cost-book System.

Art. VI.—CONSIDERATIONS ON AMERICAN MINING OPERATIONS.*

Mining operations here are as yet only in their infancy. The most extensive workings can hardly be regarded as more than surface diggings. This is emphatically true with regard to all deposits of mineral, with the exception of coal mines; and even here, we have advanced so little way as to encounter few of those embarrassments which harass the miner in the vast subterranean collieries of Europe, and call for the exercise of the highest skill and ingenuity. Doubtless this is to be ascribed, in a great degree, to the more attractive allurements which other departments of industry have presented, and the greater ease and dispatch with which they could be prosecuted. The novelty of the pursuit in this country, and the lack of practical knowledge, have been obstacles which could be overcome only by the certain prospect of finding immense treasures beneath the surface.

Extensive operations and a development of national skill and enterprise in this pursuit, are the result of time. Centuries have been required to open those extensive mines to be found in some countries of Europe; yet, even there, mining may be regarded as a modern pursuit, if we remember the long period which those countries have been inhabited, and during which mankind have extensively used the metals. Of the mining operations previously to the discovery of America, we possess very limited knowledge, and they have yielded to us no valuable practical information. The successful workings in South America and Mexico had their influence upon the industry of the old countries, and served to arouse it, somewhat as the results of mining in California have reacted upon us, and awakened the present extensive and enterprising spirit.

It requires no imagination to conceive of the field of labor spread before us. The extent, the army of laborers, the treasures gathered from the bosom of the earth, the wealth it will add to the present stock, and the greater diffusion of the necessaries and even luxuries of life, which must follow, are topics which can now be investigated upon a basis of facts.

Nevertheless, apart from all incidental circumstances, mining has in itself hindrances to a rapid development. It is in a measure a *terra incognita* to the mass of the public—a pursuit, of

* A Treatise on Metallurgy; comprising Mining and General and Particular Metallurgy, with a description of Charcoal, Coke, and Anthracite Furnaces and Blast Machines, Hot and Cold Blast, Forge Hammers and Rolling Mills, etc., etc. By Frederick Overmann, Mining Engineer, with three hundred and seventy-seven wood engravings, 8vo., pp. 720. New-York; D. Appleton & Co.

which they possess no clear and distinct ideas. It is carried on under ground, the access to which is often through passages of frightful aspect to most men. In mining also, if we may quote the language of a writer upon the subject, "as in architecture, the best method of imparting instruction is to display the masterpieces of the respective arts, which speak clearly to the mind through the medium of the eye." It is not so easy, however, to represent at once the general effect of a mine, as it is of an edifice, because there is no point of sight from which the former can be sketched at once, like the latter. The subterraneous structures certainly afford some of the finest examples of the useful labors of man, continued for ages, under the guidance of science and ingenuity; but, however curious, beautiful, and grand in themselves, they cannot become objects of a panoramic view. It is only by the lights of geometry and geology that mines can be contemplated and surveyed either as a whole or in their details; and, therefore, these marvellous subterranean regions, in which roads are cut many hundred miles long, are altogether unknown or disregarded by men of the world. Should any of them, perchance, from curiosity or interest, descend into these dark recesses of the earth, they are prepared to discover only a few insulated objects, which they may think strange or possibly hideous; but they cannot recognize either the symmetrical disposition of mineral bodies, or the laws which govern geological phenomena, and serve as sure guides to the skilful miner in his adventurous search.

We have been led into these thoughts by the volume before us, which made its appearance some little time since, and is perhaps the most extensive on the general subject of mining and metallurgy thus far issued from the American press. Its author, who emigrated to this country from Germany, had acquired a scientific reputation at home for improvements in the manufacture of iron, and held many honorable positions. In this volume he has considered the subjects of "Mining and General and Particular Metallurgical Operations." In the part on mining, his observations are general, and often quite practical. In some instances, where prices of labor are stated, an allowance is necessary for the advance in wages of the last year. Under "General Metallurgical Operations," he treats of assaying and all those materials which are requisite for the extensive manufacture of metals. The last part is devoted exclusively to the Ores, Manufacture and Uses of Metals. It is a valuable treatise, and has already proved itself such with the public. Had he lived, the part on mining would doubtless have been enlarged to an extensive work. It possesses very valuable suggestions. The following on "Explorations," can hardly come amiss:—

TO DETERMINE THE VALUE OF A MINE.

When a deposit has been so far explored, as to show the nature of the vein, and the quality of the ore has been examined superficially, as to its value to the smelter, the vein is opened by penetrating farther into it. Sufficient room is now made to work the vein, and the whole thickness is cut out, for some extent. The amount of the vein taken out must be in proportion to the angle of the walls of the vein, that is, the rock on each side of it; are these parallel, that is, do they show no curves or divergence, we are justified in concluding the vein to be uniformly thick. A few yards, or from twelve to fifteen feet, are in most cases sufficient to investigate the character of a vein. Are the walls of the vein curved, or divergent in one or the other direction, we have to act more cautiously and continue to explore it. If the divergence increases rapidly, we may conclude the vein to be a lode or mass of more or less extent. In all cases it is necessary to expose the walls of both sides, so as to obtain a correct view of the inclination of the axis of the vein. The axis is that plane which is equidistant from the walls of the vein; and as this plane is not always straight, we divide it into a number of small straight planes, or convert it into a curved plane.

The conditions, under which the operations of exploring may be continued, must now be considered before proceeding any farther with the operation. The first consideration involved relates to the nature of the ore. It must be assayed as to its quality, and if an opportunity is afforded by smelt works, to test it on a large scale, at least some tons ought to be smelted; and if we want a thorough trial, one furnace ought to work this particular ore at least until all other ore and metals are tapped, and the trial ore is the only one in the furnace. This test smelting is necessary for iron, lead, copper, zinc, and similar ores. The value of the ores of precious metals can be ascertained by the assay, on a small quantity, with perfect certainty; also the value of mercury, nickel, and some others. In those cases where the value of the metal produced depends on its purity, a trial on the large scale never ought to be omitted. It is almost impossible to find a small quantity of phosphorus or sulphur in iron ore by the assay, while the quantity of that substance may be large enough to injure the quality of iron manufactured, so as to make it unsalable.

The next consideration is the price of ore, that is, the expenses of mining. If the vein or deposit is in alluvial soil, the body of ore and its direction will afford the means of ascertaining the amount of incumbent earth to be removed. The price at which this may be accomplished, reduced to one ton of ore, or any other measure we choose, forms the standard of dead work. If the vein is imbedded in rock, the expense will depend very much on the solidity and hardness of the ore itself; the price of digging it is, however, chiefly regulated by the undermining, and the thickness of the vein. If the vein is bedded upon a soft understratum, which may be easily penetrated by the pick, it shows to the best advantages to the miner for taking out the ore. This undermining is of the utmost importance, and in many instances determines the value of the vein. The best position for it is below the vein, between the rock and the vein; its thickness, if but two inches, is sufficient; three inches are better, and if thicker than that, there is no harm in it. The undermining may be in the middle of the vein, or at the top of it, or it may be in the rock above or below the vein; in all cases it forms the most important auxiliary to the miner; without it the work progresses but slowly, and must be expensive. The undermining may be a vein of soft clay, or clay slate, shale, carbonate of lime in stalactites, gravel, sand, or ore in a loose form; crevices in the vein, or water-courses near it. The nature of the adjoining rock has no influence upon the price of the ore; it bears only a proportional part on the whole amount of ore raised, so far as dead work is to be performed in it. The location of the vein forms another object of our consideration. If the vein is in low, marshy ground, the accumulation of water will be great, and the expenses of removing it considerable. If the vein is so located that the water above it may filtrate into the mine, and annoy the miner, it is a means of increasing the expenses of

extraction. If the vein dips from the place of exploration it will accumulate water, and water-courses must be cut into the bed rock to remove it. The price of labor and the facility of procuring workmen, is an object to be well digested before forming the conclusions as to the cost at which the ore can be dug. In a populous country laborers may be had at any time, skilful miners, however, may be scarce, and the latter are as necessary to insure good success as any other item in the calculation. Good, sober workmen, perform always the cheapest labor; but these claim the comforts of civilization, and if we are to procure those comforts for them, it cannot be done without incurring expenses which are frequently neglected in the estimates by those who lay the plans of mining operations. The price of labor is or may be considered uniform over the United States, but it is evidently higher in the western and southern States than in the east and north. Nominally, the wages paid are higher in the latter parts of the Union, but really, the labor performed is cheaper; the workmen do more work, and do it better than in the south and west of the Union. The labor in the Pacific States and territories is at present high, and rich mineral deposits only will pay the expenses necessarily connected with mining operations in them. This state of things, however, is temporary, and will disappear in the course of a few years, provided they possess lasting mineral treasures. Fuel is in most instances an important item in determining the value of an ore deposit. Gold deposits, in alluvial ground, or where it is found in abundance in the metallic state in veins, does not require much fuel for its production. The supply for a steam engine is in most cases all that is required, but even this is in many instances an important item of expense. Zinc requires a large amount, and therefore cheap fuel. Iron requires less, but still a cheap fuel. In the production of lead and other metals, there is less objection to using expensive combustibles. The price and quality of timber is often a large item of expenditure in mining operations; in extensive and heavy lodes, in friable rock, and damp mines, the wood does not last long, and much is required. Pine wood is by far more expensive than leaf wood, because of its brief durability. The facilities for transportation, or the proximity of smelt works, or a market, is an object generally well understood by our citizens, and needs only to be mentioned as an active agent in determining the value of a mine. All these considerations taken together, form the basis for estimating the price of ore, and the value of a mine.

The price of a ton of ore, for which we assume 2240 pounds, avoirdupois, is regulated by the market for it, or by the smelt works. Gold ores, which appear in the form of ferruginous slates, free from adhesive clay and not too hard, may be crushed and amalgamated; in fact the metal obtained from it, at an expense of one dollar per ton in the mill, driven by a steam engine. The quantity of gold in such ores is therefore the means by which to determine the value of the mine. If we subtract one dollar from the actual quantity of gold in a ton of rock, for the necessary expenses, we obtain the value of the remaining gold which is to pay for raising the ore. If the ore contains much clay it impedes the progress of work in the mill, and $1 50 may be set down as mill expenses. If the ore contains iron or copper pyrites, a large quantity of quicksilver is lost in amalgamation, which may increase the expenses to $2 and more. The presence of lead and other metals of similar nature increase the mill expenses, because mercury is absorbed by these metals and lost. The mill expenses constitute a necessary and unavoidable outlay, and these are the first items to be considered; the remaining quantity of metal must pay the expenses of mining. the interest on the capital invested, and furnish the profits. If the veins of gold ore are composed of a soft slate, such kind as most of the Virginia mines show, and are so thick as to admit of a man standing upright to work in them, a ton of ore can be dug at from 60 to 75 cents average wages; to which amount dead work and interest on capital is to be added. If the vein is composed of hard rock, such as some of the vitrified magnesia slate and quartz veins of North Carolina and Georgia, the price of mining increases from $1 to $3, and more. Is the vein thin, so that a part of the dead rock is to be taken out in order to admit the miner, the coast of working the rock increases the expenses of the

ore, and must be taken into account. A man may dig a ton of soft slate at 50 cents, hard slate at $1 to $3, and hard quartz, porphyry or stratified gneiss, at $2 to $6. The general expenses, such as dead work, pumping, hoisting, ventilating, and others, are proportioned to the whole amount of ore taken out of the deposit and calculated per ton; of this we shall speak hereafter. Open digging and an injudicious method of work may produce cheap ore for a certain time, but it infallibly increases the expenses of extraction rapidly with the depth, and generally encumbers a mine for ever. Skilfully conducted work below ground is always the cheapest in the course of time; it causes more expense than open work at first, but this, when compared to the body of ore, is generally found to be very small, and soon is repaid by the superior advantages accruing to the miner, and by the facilities it affords in employing steam or water power to assist the miner in removing the ore and the water.

The expenses of producing a ton of pig iron in the smelt works are from $10 to $15, exclusive of interest on capital invested. The latter generally increases the cost to the amount of $1 50 to $2. If the price of pig iron is $20, and the smelting cost $11 50, the ore necessary for a ton of iron may cost $8 50, which price, however, would give no profit to the smelter, and no fund for incidental expenses. Two tons of rich magnetic ore can produce a ton of iron; this kind of ore may therefore cost $4 a ton. Three tons of good hematite, or red oxide, are in most cases required for making a ton of iron, and such ore should not cost more than $2 66. The poor hematites, bog ores, and poor ores generally, do not furnish more than 25 per cent. of metal, and such ore cannot be worth more than $2 per ton. The price of pig iron varies according to quality; it is higher for charcoal than for anthractic and coke iron, and higher for cold than hot-blast iron. But this does not enhance the value of the ore, because these are items which increase or diminish the cost of smelting. On an average we may assume, that if a ton of rich magnetic ore costs more than $4 at the smelt works, good hematite more than $3, and poor ores more than $1 50 or $2, they are too expensive for our iron manufacturers.

The price of lead ore at the Missouri lead mines varies from $20 to $40 per ton. The smelters buy it at that rate. The latter price is not generally paid, and $30 may be considered the average for clean ore. If the ore veins happen to be strong, the miners make good wages; but the business is not so remunerating as to insure large profits. The smelt works yield but little, and so the miners suffer. If mining was carried on here with judgment and capital, the price of the ore might be reduced considerably, but there is little prospect at present for such investments. The expense of smelting a ton of lead from good ore amounts to about $15; and if incidental expenses and interest on capital are considered, it may be estimated at $20. If the price of metallic lead is $3 at the smelt works per hundred pounds, it will bring a ton to $66, from which the smelting is to be deducted; the remainder is for ore and profit. Galena will yield about 60 per cent. of lead when pure, this makes more than 1·5 tons of ore necessary for one ton of metal, and if the ore is as high as $30, it leaves but little or no profit to the smelter.

Copper ores sell at a uniform price at the smelt works, and $2 50 per cent. per ton is the average price paid for ores. That is, a ton of ore which contains 10 per cent. of copper, and is free from injurious metals, such as lead, pays $25 at the furnaces.

Other ores than those mentioned are uncertain in their value; the amount of metal does not directly influence their price. It is the admixture of other matter which has the most decided bearing upon their valuation. We shall refer to these ores in their proper places; and also allude to the value of coal and combustibles, in the chapters assigned to these various subjects.

The author's views upon the formation of mineral deposits, exert an influence upon the plan he would propose for the working of any particular mine, and are thus worthy of consideration.

Theory of the formation of mineral deposits.—The sulphurets of gold, platina, tin, antimony and arsenic, are subject to the same laws of affinity, that is, are soluble in alkalies, and when exposed to a certain degree of heat in the presence of an acid, such as silex, the sulphur is dissipated, and gold or platina are reduced to their metallic state, and disseminated through the rock. Tin, antimony and arsenic, having a great affinity for oxygen, become oxidized, and the first concentrates, in virtue of its great cohesion, into crystals of oxide of tin, which are heavy and cannot be carried far from their origin; antimony and arsenic are more soluble, and may be carried to a certain distance, precipitating on matter to which they have most affinity. The alkalies which originally held these sulphurets in solution are washed away, and combine with acids, being deposited still further off from that place where the sulphur was dissipated than the lightest of the oxides of the heavy metals. On this theory of the formation of mineral deposits, which supposes all the heavy metals to have been originally in combination with sulphur, we must find gold, platinum, and the platinum metals, near the oldest rocks, and rocks of igneous origin, in a metallic state; tin, antimony and arsenic, near these sources in an oxidized state; iron everywhere, because in the presence of oxygen or water its sulphur was driven off, the iron being oxidized and condensing near its source into solid crystals, or amorphous masses, which latter floated off, to be deposited in places where affinity held it. Lead, having the greatest affinity for sulphur, would dissipate with it, and float to some alkaline deposit where it is attracted. Similar results, caused by the same force, may be traced with almost all mineral matter. If we suppose that in the primitive condition of the earth, less oxygen was combined with matter, and that a mixture of all the elements existed, with little or no oxygen, we find a sure guide for tracing the origin of the deposits. This theory is strongly supported and corroborated by the successive oxidation of the rocks generally. Volcanic eruptions, which may be compared to the first operations on the thin crust of the earth, emit sulphurous vapors, chlorides, and volatile metals, and deposit oxides. The silicates thrown off by these forces are in a low degree of oxidation; this is, therefore, an evidence of a want of oxygen in the deep. Granite is in a state of higher oxidation, but not the highest. The stratified rocks contain more and higher oxidized matter than granite; the coal formations more oxygen than transition rocks, and the tertiary rocks more than either of the foregoing, hydrates making their appearance among them, which is a certain indication of a high state of oxidation. In the most recent deposits we find hardly any matter which is not oxidized to the highest degree of its natural capacity for oxygen.

As a theory, accounting for the distribution of minerals over the globe, we consider the foregoing more satisfactory than that based upon the facts eliminated by geology. It at once explains the cause, and accounts for the locality of a deposit. We find by its assistance, why gold, tin, antimony, and arsenic, cannot be found far off from granite, and must be in or near silicious rock, no matter what its age and history may be. We find also, that more silver must be in the galena of silicious deposits, than in the galena of alkaline rock. It accounts for those deposits which are the result of infiltration, for masses, and stratified veins. Injections from below, lifted by heat from the deep, are in their primitive condition and are not subject to the above rule; they are recent evaporizations or injections in mass, condensed by the cold strata, or massive rock which they penetrate.

In taking all these elements together, we obtain the means for forming the plan of working a mine. It requires different means to work an alluvial mass or vein, a mass in secondary rock, infiltrated or injected veins. The object is in all cases to obtain the minerals at the least expense. If we commence the working of a vein at a higher elevation than its lowest point, we may incur great additional expenses in driving for the lower parts of it by subsequent dead work, the labor spent on the first being entirely lost. If we attack a mass at its top instead of at its bottom, we may permanently injure the mine. Before a pick is used in the opening of the mine, all advantages and disadvantages must be well considered.

The nature and value of the mineral must be known, the extent and thickness must have been investigated; its lowest and its highest points ascertained, and the probability of the origin of the deposit must form an item in determining the working plan. When all these facts have been laid down in a well drawn plan on paper, the disposition of shafts, levels, galleries, drainage, ventilation, and hoisting is provided for, and the manner of working it is decided; the expenses of the erection of machinery, and the dead work are calculated, with the cost of digging the ore and hoisting it. The value of the minerals, and the total amount which probably may be raised in the course of time, furnish the credit to the above account of expenses and shows the profit or loss which a mine may make in a certain time, or up to the time of its exhaustion.

The following are the author's remarks on the question—What are Metals?—and his classification of the same.

What are Metals?—Chemists denominate as metals those substances which are combustible, that is, which liberate heat in combining with other matter; they assert that metals are good conductors of heat and electricity, and may be polished; are fusible and opaque; heavy, malleable, and ductile, &c. These are all vague definitions; for not one of the metals answers perfectly to this description. Gold may come most completely within its compass, but if it possesses all the other particulars, it certainly is not combustible in the common sense of the term; while potassium, an equally beautiful type of metal, is extremely combustible and not heavy. We really do not see any reason why all solid substances which are not oxidized should not range with this class of matter. There cannot be any objection to calling carbon a metal; and we do not see why sulphur is less a metal than selenium or arsenic; why phosphorus is not denominated a metal as well as calcium; both are most equally combustible, and if phosphorus has no metallic lustre, that is merely indicative that it is not condensed into so narrow a space as calcium. Phosphorus is more volatile than most of the other metals; but no metal is as permanent as carbon, and still the latter is not recognized as a metal. We do not see the slightest objection to calling hydrogen a metal; it possesses almost all the properties belonging to metals. But when matter, gaseous or fluid at common temperatures, is excluded, there cannot be any objection to calling all solid elementary substances metals. Silicon so much resembles a metal in all its properties, that its exclusion cannot be justified, and most philosophers range it with the metals.

Classification of Metals.—The number of metals which are regarded as useful, is very limited. But, as many which are of no direct, practical use, enter into combination with those which are generally useful, it is necessary to allude to some of the former, although their interest arises solely from their combination with others. In entering on this part of our work we are under the necessity of classifying the metals in some such manner as shall be useful to the smelter. The most rational classification appears to be founded upon the relation of metals to oxygen, supposing that the reduction of oxides is effected by means of carbon. The number of elements which form minerals is sixty-two, all of which have more or less influence in metallurgical operations. About fifty of these elements are considered metals by chemists, of which nearly half the number are found in such large quantities as to be of importance to the smelter. A large number of metals form slags, as oxides or other compounds, and are hardly known in their pure condition: still these are of high interest, not only because they form slags, but because these slags invariably impart a peculiar quality to the metal which is smelted under their influence. We may, therefore, divide the useful metals into two groups, the one which forms chiefly slags, and the other chiefly metals. To the first division the following belong, viz.: Potassium, Sodium, Calcium, Magnesium, Manganese, Aluminum, Selenium, Titanium, Tellurium, Arsenic, and Chromium. The second group will then consist of Zinc, Cadmium, Iron, Nickel, Cobalt, Antimony, Lead, Bismuth, Copper, Mercury, Silver, Platinum, and the Platinum metals, and Gold.

Art. VII.—NORTHAMPTON MINING DISTRICT.

The continuation of Mr. Richardson's Report on the Northampton Mining District is in type, but we have deemed it advisable to postpone its insertion until the number of the *Mining Magazine* for January, in order to afford the Engravers more time to execute some extremely fine illustrations which accompany the Report.

We have the pleasure to inform our readers, that since our last publication, Mr. Richardson has been engaged in the survey of some extensive mineral property near the centre of Connecticut; some of which he has found to be of immense value, and which will probably be described in the next number of the Magazine. He is at present exploring in the neighborhood of Lake Champlain, and also at the White Mountains, partly for an English Company and partly for a private firm in this city; we anticipate something interesting from this remote quarter, particularly as Tin mines are supposed to exist in the latter District.

Art. VIII.—THE SILVER OF LAKE SUPERIOR.

In an article on "The Silver of the Lake Superior Mineral Region," in the November number of the *Mining Magazine*, the question was left to be settled whether the silver in that region appeared only in a native state, or there was also to be found an ore of silver? This last position seemed to be asserted in consequence of some late experiments referred to. We have since that time made several analyses of ores from the Michipicoten, American, and Minnesota Mines; and also of veinstones from the Albion Mine, and although we found in all those ores more or less native silver, which extends in the Michipicoten ore to a high percentage, and also traces of native silver in the so-called veinstone, we have not yet been able to discover any ore of silver.

As to the practicability of extracting native silver from Lake Superior ores, there can hardly be any doubt that many of them could be worked for this purpose to great advantage; and it is indeed a singular fact, that no arrangements have yet been made any where to save this precious metal. There are in Europe ores worked profitably for silver, which do not yield one tenth of what is stated by reliable assayers to be the average yielding of silver of several Lake Superior ores. The most practicable method of extracting the silver from all those ores, which may be crushed and pulverized, appears to be what is called from its inventor, Augustin's process. But for the extraction of the silver from native copper in lumps, we do not see any other way than by smelting with lead, and concentrating the silver in the

latter metal. A party intending to undertake such an enterprise, would execute it most advantageously by taking hold of a good silver lead mine, and working the copper with the lead together for the silver in both metals. In a report some years ago, Dr. Jackson recommended the Shelburne Mines for such an operation, in consequence of their convenient location as well as their rich argentiferous ores. May the time soon be terminated when thousands of dollars worth of silver are yearly lost for want of a suitable establishment for its extraction. A. P.

JOURNAL OF MINING LAWS AND REGULATIONS.

AN ACT to provide for the Formation of Corporations for certain purposes.

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Section 1. Corporations for manufacturing, mining, mechanical, or chemical purposes, or for the purpose of engaging in any species of trade or commerce, foreign or domestic, may be formed according to the provisions of this act; such corporations and the members thereof being subject to all the conditions and liabilities herein imposed, and to none others.

Sec. 2. Any three or more persons who may desire to form a company for any one or more purposes specified in the preceding section, may make, sign, and acknowledge, before some officer competent to take the acknowledgment of deeds, and file in the office of the county clerk of the county in which the principal place of business of the company is intended to be located, and a duplicate thereof in the office of the Secretary of State, a certificate in writing in which shall be stated the corporate name of the company; the objects for which the company shall be formed; the amount of its capital stock; the time of its existence, not to exceed fifty years; the number of shares of which the stock shall consist; the number of trustees, and their names, who shall manage the concerns of the company for the first three months, and the names of the city or town, and county, in which the principal place of business of the company is to be located.

Sec. 3. A copy of any certificate of incorporation, filed in pursuance of this act, and certified by the county clerk of the county in which it is filed, or his deputy, or by the Secretary of State, shall be received in all courts and places as presumptive evidence of the facts therein stated.

Sec. 4. When the certificate shall have been filed, the persons who shall have signed and acknowledged the same, and their successors, shall be a body politic and corporate in fact and in name, by the name stated in the certificate, and by their corporate name have succession for the period limited, and power: 1st. To sue and to be sued in any court; 2d. To make and use a common seal and alter the same at pleasure; 3d. To purchase, hold, sell, and convey such real and personal estate as the purposes of the corporation shall require; 4th. To appoint such officers, agents, and servants, as the business of the corporation shall require, to define their powers, prescribe their duties, and fix their compensation; 5th. To require of them such security as may be thought proper for the fulfilment of their duties, and to remove them at will, except that no trustee shall be removed from office, unless by a vote of two thirds of the whole number of trustees, or by a vote of a majority of the trustees, upon a written request signed by stockholders of two thirds of the whole stock; 6th, To make by-laws, not inconsistent with the laws of this State, for the organization of the company, the management of its property, the regulation of its affairs, the transfer of its stock, and for carrying on all kinds of business within the objects and purposes of the company.

Sec. 5. The corporate powers of the corporation shall be exercised by a board of not less than three trustees, who shall be stockholders in the company, and a majority of them citizens of the United States, and residents of this State, and who shall, after the expiration of the term of the trustees first selected, be anually elected by the stockholders, at such time and place, and upon such notice, and in such mode as shall be directed by the by-laws of the company; but all elections shall be by ballot, and each stockholder, either in person or by proxy, shall be entitled to as many votes as he owns shares of stock; and the persons receiving the greatest number of votes shall be trustees. When any vacancy shall happen among the trustees, by death, resignation, or otherwise, it shall be filled for the remainder of the year in such manner as may be provided by the by-laws of the company.

Sec. 6. If it should happen, at any time, than an election of trustees shall not be made on the day designated by the by-laws of the company, the corporation shall not for that reason be dissolved; but it shall be lawful on any other day to hold an election for trustees, in such manner as shall be provided for by the by-laws of the company; and all acts of trustees shall be valid and binding upon the company until their successors shall be elected.

Sec. 7. A majority of the whole number of trustees shall form a Board for the transaction of business, and every decision of a majority of the persons duly assembled as a Board shall be valid as a corporate act.

Sec. 8. The first meeting of the trustees shall be called by a notice, signed by one or more of the persons named trustees in the certificate, setting forth the time and place of the meeting, which notice shall be either delivered personally to each trustee, or published at least ten days in some newspaper of the county in which is the principal place of business of the corporation, or if no newspaper be published in the county, then in some newspaper nearest thereto.

Sec. 9. The stock of the company shall be deemed personal estate, and shall be transferable in such manner as shall be prescribed by the by-laws of the company, but no transfer shall be valid except between the parties thereto, until the same shall have been entered in the books of the company, as to show the names of the parties by and to whom transferred, the number and designation of the shares and the date of the transfer.

Sec. 10. The trustees shall have power to call in and demand from the stockholders the sums by them subscribed, at such times and in such payments or instalments as they may deem proper. Notice of each assessment shall be given to the stockholder personally, or shall be published once a week for at least four weeks in some newspaper published at the place designated as the principal place of business of the corporation, or if none is published there, in some newspaper nearest to such place. If, after such notice has been given, any stockholder shall make default in the payment of the assessment upon the shares held by him, so many of such shares may be sold as will be necessary for the payment of the assessment on all the shares held by him. The sale of said shares shall be made as prescribed in the by-laws of the company: Provided, that no sale shall be made except at public auction to the highest bidder after a notice of thirty days, published as above directed in this section, and that at such sale the person who will agree to pay the assessment so due, together with the expense of advertisement, and the other expenses of sale for the smallest number of whole shares, shall be deemed the highest bidder.

Sec. 11. Whenever any stock is held by any person or executor, administrator, guardian or trustee, he shall represent such stock at all meetings of the company, and may vote accordingly as a stockholder.

Sec. 12. Any stockholder may pledge his stock, by a delivery of his certificates or other evidence of his interest, but may nevertheless represent the same at all meetings and vote accordingly as a stockholder.

Sec. 13. It shall not be lawful for the trustees to make any dividend, except from the surplus profits arising from the business of the corporation; nor to divide, withdraw, or in any way pay to the stockholders, or any of them, any

part of the capital stock of the company, nor to reduce the capital stock unless in the manner prescribed in this act, and in case of any violation of the provisions of this section, the trustees under whose administration the same may have happened, except those who may have caused their dissent therefrom to be entered at large on the minutes of the Board of Trustees at the time, or were not present when the same did happen, shall, in their individual and private capacities, be jointly and severally liable to the corporation, and to the creditors thereof, in the event of its dissolution, to the full amount so divided, withdrawn, paid out, or reduced: Provided, that this section shall not be construed to prevent a division and distribution of the capital stock of the company, which shall remain after the payment of all its debts, upon the dissolution of the corporation or the expiration of its charter.

Sec. 14. The total amount of the debts of the corporation shall not at any time exceed the amount of the capital stock actually paid in; and in case of any excess, the trustees under whose administration the same may have happened, except those who may have caused their dissent therefrom to be entered at large on the minutes of the Board of Trustees at the time, and except those who were not present when the same did happen, shall in their individual and private capacities be liable jointly and severally to the said corporation, and in the event of its dissolution, to any of the creditors thereof for the full amount of such excess.

Sec. 15. No corporation organized under this act shall, by any implication or construction, be deemed to possess the power of issuing bills, notes, or other evidences of debt for circulation as money.

Sec. 16. Each stockholder shall be individually and personally liable for his proportion of all the debts and liabilities of the company contracted or incurred, during the time that he was a stockholder, for the recovery of which, joint or several actions may be instituted and prosecuted.

Sec. 17. No person holding stock as executor, administrator, guardian or trustee, or holding it as collateral security or in pledge, shall be personally subject to any liability as a stockholder of the company; but the person pledging the stock shall be considered as holding the same, and shall be liable as a stockholder accordingly, and the estate and funds in the hands of the executor, administrator, guardian or trustee, shall be liable in like manner and to the same extent as the testator, or intestate, or the ward or person interested in the trust fund would have been if he had been living, and competent to act and hold the stock in his own name.

Sec. 18. It shall be the duty of the trustees of every company incorporated under this act, to cause a book to be kept containing the names of all persons, alphabetically arranged, who are or shall become stockholders of the corporation, and showing the number of shares of stock held by them respectively and the time when they respectively became the owners of such shares; which book, during the usual business hours of the day, on every day except Sundays and the Fourth of July, shall be open for the inspection of stockholders and creditors of the company, at the office or principal place of business of the company; and any stockholder or creditor shall have the right to make extracts from such book, or to demand and receive from the clerk or other officer having charge of such book, a certified copy of any entry made therein; such book or certified copy of any such entry shall be presumptive evidence of the facts therein stated, in any action or proceeding against the company, or against any one or more stockholders.

Sec. 19. If the clerk or other officer having charge of such book, shall make any false entry, or neglect to make any proper entry therein, or shall refuse or neglect to exhibit the same, or to allow the same to be inspected or extracts to be taken therefrom, or to give a certified copy of any entry therein, as provided in the preceding section, he shall be deemed guilty of a misdemeanor, and shall forfeit and pay to the party injured a penalty of one hundred dollars and all damages resulting therefrom; and for neglecting to keep such book for inspection, as aforesaid, the corporation shall forfeit to the people the sum of one hun-

Sec. 26. Any company incorporated under the said fifth chapter of an act concerning corporations, passed April 22, 1850, may continue its corporate existence under this Act by adopting a resolution to that effect by a vote of two-thirds of all the stockholders, and filing a certificate thereof, signed by its proper officers, in the office of Secretary of State and of the County Clerk of the county in which is located the principal place of business of the corporation. From the time of filing the certificate the corporation shall be subject only to the provisions of this Act, but the change so made shall not affect any right acquired or liability incurred previously by the corporation.

Sec. 27. Corporations formed under this Act, and the members thereof, shall not be subject to the conditions and liabilities contained in an Act entitled "An Act Concerning Corporations," passed April 22, 1850.

COMMERCIAL ASPECT OF THE MINING INTEREST.

The operations in mining stocks in New-York, during the last month, have been unusually limited, and no change is presented in them worthy of note.

The aspect of mining stocks for the last six months presents very marked and decided improvement. The progress of mining operations in some instances has been such as to yield a handsome revenue to stockholders, and in other cases, the character of the mines has been sufficiently developed to prove that profitable returns will ere long be made to the investment of the owners. At some mines operations have little more than been commenced, while there are a few which have yet to make a beginning. Enough, however, has been done to establish public confidence in the great value of our mineral wealth, and to render it comparatively easy to command capital for its use. The information possessed by the public, respecting mines and mining operations, has greatly increased, and is spreading every day.

After all, this state of things is only the first dawning of a great branch of national industry. Our labor thus far has been confined almost at the surface, and hardly an example of very extended and systematic mining is to be found, yet the product of our gold regions and our coal fields exceeds that of our cotton fields. We have in addition, our iron, copper, and lead mines, and various mineral products, which, with their varied manufactures, furnish a field of industry and wealth far beyond the conceptions of the most sanguine and enthusiastic. It is these considerations united to the permanent value which the metals always possess, and the unusually favorable facts which have appeared upon systematic explorations, that have secured to the mining interest such strong confidence in so brief a period. The future opening before us is one of hard labor to the miner, but abounding in indications of rare and unexampled prosperity.

BOSTON MINING SHARE MARKET.

Boston, Nov. 19, 1853.

Since our last, the money market has continued very stringent for most of the time, and, as a natural consequence, stocks of nearly all descriptions have been dull and declining. *Mining Shares* have sympathized with the general depression, and are therefore nearly all several per cent. lower than one month

since. The scarcity of money has been the sole cause of the general decline; for the majority of the different companies never stood better than at the present moment. The news from the mines is of a highly favorable character, and the prospects for the future are flattering. We think that the worst has been passed, in money matters, and if so, a general improvement may be safely calculated on; for the present low prices cannot be maintained, with money even at comparatively easy rates.

We alluded, last month, to a rumor of a forthcoming dividend on the *Minnesota*, which it now seems has been delayed, on account of the inability of the company to dispose of their copper at the price they held it at. There is now some prospect that it can be sold at their price (29 to 30 cents per lb.), and *when* thus disposed of, a dividend of probably $30 per share will be made. The uncertainty in relation to this dividend has had a tendency to keep down the market value of the stock, and at one time it was heavy at 170, but now 180 is bid, and a few shares only, offered at 195.

Pittsburg has fallen off to 149, and being within three months of a *certain* dividend of not less than $7 50 per share, and perhaps $10, the stock may certainly be classed as cheap. Some months since the shares sold at $195, when the basis of merit was certainly no better than now, and probably not so good by 20 per cent. at least. Since this Company commenced paying dividends in May 1849, they have divided $59 per share among their stockholders, while the whole amount of assessments called for from the beginning, has been only $18 50 per share. These results, great as they are, will probably be looked upon, some years hence, as a small affair when compared with the success of companies now in their infancy.

Copper Falls has fallen, under the money pressure, to 45, the lowest since May 1st, but in the mean time, $5 per share has been paid in, so that the stock is actually that amount lower than in May, when selling at 45. A reaction has taken place within a few days, however, and now 46½ is offered, without producing the shares. With ease in money this stock would advance $5 to $10 per share, very readily. *Toltec* has declined to 9½, with the assessment of $1 per share paid, which became due the 15th. The stock is considered cheap, and only awaits a little activity in the market, to rise several dollars per share. *Forest*, after running up to 12 rather suddenly, has since fallen to 9 bid, 10 asked, and there is no great disposition to purchase. This price includes the assessment of $5 per share, called in on the 10th of Oct. *Isle Royale* is firm at 16, assessment of $1 paid, and but little stock comes upon the market, which helps very much to keep up the price of the shares in times like the present, *Norwich* sold at 11 within a few days, which price includes an assessment of 50 cents per share, called for the 15th of the present month. This makes the whole amount paid in $4 per share, on 20,000 shares. *Phœnix* is in quick demand at 7, a good amount of silver having been discovered among the ore from this mine; 7 was offered for 500 shares, a few days since. *Ripley* declined to 3¼ last week, but is now in demand at 3¾ bid, and the prospects are favorable for farther improvement. Purchasers are bidding freely for the stock, "buyers option" 60 or 90 days, an indication of higher prices. *Winthrop* has declined to 2½, but is now held firm at that figure.

The following assessments have been called for since our last:

Companies.	Amount per share.	When payable.	Where payable.
Norwich,	50 cents	Nov. 15,	Windsor, Vt.
Derby,	50 cents	Dec. 1,	Windsor, Vt.

The above companies have 20,000 shares each, and are two of the number comprising the ***American Mining Company***, the treasurer's office of which is at Windsor, Vt., and they have an agency in New-York, but all transfers of stock have to be made at Windsor, Vt., as we learn from the treasurer.

In the shares of companies not particularly mentioned, there has been little or no activity, and they are generally heavy at quotations. Within a few days there have been signs of returning activity, and we hope, a month hence, to note a material improvement from the present unusually low figures.

We present our usual table of fluctuations, with some improvements this month, which will render it more valuable, by giving the reader a better idea of the present condition of each company.

BOSTON MINING SHARE LIST.

Fluctuations for October, 1858, in twenty-five different Mining Stocks, sold at the Boston Shares & Exchange Board, showing their Highest and Lowest Points, and the Date, with the Market Value at the close of the Month, Gain or Loss for the Month, and number of Shares sold in each.

Mining Stocks, Boston.	Nominal Capital.	Shares.	Par	Paid in, Nov. 19.	Highest Sales.	Day Mo.	Lowest Sales.	Day Mo.	Value, Oct. 31	From Sep. 30. Gain.	From Sep. 30. Loss.	Shares sold in October.	Value Nov. 19
Adventure, *Copper*,	$250,000	10,000	25	$11,00	—	—	—	—	4	0	0	No sale.	*4¼
Algomah,	500,000	20,000	25	1,37½	*2¼	23	*2	15	2½	—	¼	320	2¼
Bay State,	500,000	20,000	25	*2,00	—	—	—	—	1¼	0	0	No sale.	1¼
Bohemian,	...	10,000	—	—	—	—	—	—	2¾	—	1	No sale.	2¾
Boston,	500,000	20,000	25	† 2,00	—	—	—	—	2¾	—	1	No sale.	2¾
Copper Falls,	300,000	10,000	20	56	56	7	52	31	52	—	6	186	46¼
Dana,	500,000	20,000	25	—	2	11	1½	15	1½	0	0	18	1½
Forest,	200,000	10,000	20	15,00	*12	21	4½	11	*11	—	¼	1249	*9¼
Fulton,	500,000	100,000	5	† 2,00	2¼	4	1 9-16	29	1½	—	¼	6429	1¼
Glen,	500,000	20,000	25	2 000	2¼	24	2¼	24	2	—	¼	5	2
Isle Royale,	120,000	12,000	10	6,00	16¼	27	14½	5	16	*0	0	1144	*16¼
Malone, *Sandstone*,	400,000	40,000	10	† 3,00	1	1	¾	18	1	—	¼	2880	¾
Manassas, *Mining*,	1,000,000	100,000	10	† 2,00	—	—	—	—	1½	—	¼	No sale.	1¼
Manitou, *Copper*,	100,000	20,000	5	1,25	—	—	—	—	1¼	—	½	No sale.	1¼
Minnesota,	300,000	3,000	100	22,00	170	8	170	8	180	5	—	2	185
National,	250,000	10,000	25	2,00	—	—	—	—	25	—	5	No sale.	25
Native,	250,000	10,000	25	3,25	—	—	—	—	3	0	0	No sale.	3
North American,	....	10,000	—	17,00	—	—	—	—	67	—	3	No sale.	67
Norwich,	100,000	20,000	5	4,00	11	1	10	29	10	1	—	100	*11
North Western,	......	9,000		12,00	16	4	16	4	16	—	2	100	*18
Phenix,	300,000	10,000	30	6,00	7¾	23	7	19	7½	—	¼	430	7¼
Pittsburg (*Cliff*),	......	6,000	—	18,50	151	27	150	5	158	1	—	21	149
Ridge,	....	10,000	—	6,50	—	—	—	—	4½	0	0	No sale.	4½
Ripley,	500,000	40,000	12½	† 2,00	5	27	4½	14	4½	½	—	2433	4
Shawmut,	500,000	20,000	25	2,00	1¼	3	1½	17	1½	—	¼	110	1¼
Star,	500,000	20,000	25	2,50	4½	3	4	14	4½	—	¼	365	4½
Summit,	500,000	40,000	12½	† 5,00	4	24	4	24	4	—	1	100	4
Toltec,	500,000	20,000	25	4,00	12½	1	9¼	15	9½	—	3¼	5,255	*9¼
Winthrop,	500,000	20,000	25	,75	2¼	28	3¼	1	2¼	¼	—	4,060	2¼
Webster,	200,000	40,000	5	† 2,00	2 19	1	2	29	1¾	—	¼	475	1½
W. Castleton, *Slate*,	1,000,000	50,000	20	† 6,00	3¼	26	2¼	10	3¼	—	¼	595	3

* Assessment Paid. † These are fully paid stock, not assessable. The number of shares in the Algomah Company was doubled Oct. 1, and an assessment of $1 per share paid in on the 20,000 shares.

JOURNAL OF GOLD MINING OPERATIONS.

DEPOSITS OF CALIFORNIA GOLD AT THE UNITED STATES MINTS.

PHILADELPHIA MINT.

1848	$44,177 00
1849	5,451,439 00
1850	31,667,505 00
1851	46,939,367 00
1852	49,821,490 00
1853 (to July 30)	38,080,253 85
Total	$172,004,231 85

BRANCH MINTS.

	Dahlonega.	Charlotte.	New Orleans.	Total.
1848			$1,124 00	$1,124 00
1849			669,921 00	669,921 00
1850	$30,025 00		4,575,567 00	4,605,592 00
1851	214,072 00	$15,111 00	8,769,682 00	8,998,865 00
1852	324,931 07	28,361 76	3,777,784 00	4,131,076 83
1853 (to July 30)	269,607 78	15,399 49	1,389,208 02	1,674,215 29
Totals	$838,635 85	$58,872 25	$19,183,286 02	$20,100,794 12
Add deposits at Philadelphia Mint				172,004,231 85
Total California deposits to July 30, 1853				$192,005,025 97

SUBSEQUENT DEPOSITS AT PHILADELPHIA MINT.

August, 1853	$4,469,000 00
September, 1853	3,975,000 00
October, 1853	4,327,000 00
Total California deposits to October 31, 1853	$204,776,025 97

We have thus the amount of gold of California production received at the Mints up to the 1st of November, except the deposits of the last three months at the Branch Mints, which are not likely to have been of magnitude. Official documents show that the entire exports and imports of specie, from 1847 to 1853, were as follows:

	Imports.	Exports.
1847	$24,121,289	$1,907,739
1848	6,360,224	15,841,620
1849	6,651,240	5,404,648
1850	4,628,792	7,522,994
1851	5,453,592	29,472,752
1852	5,503,544	42,674,135
Total	$52,718,681	$102,823,888
		52,718,681

Net exports of specie for six years	$50,105,207
Add exports for first ten months of 1853, as ascertained from returns and estimates, say	25,000,000
Total exports of specie	$75,105,207
Receipts of California gold to October 31, 1853	$204,775,025 97
Exports of specie from 1847 to October 31, 1853	75,105,207 00
Net increase of specie	$129,670,818 97

The following is the gold coinage of the Philadelphia Mint for the month of October:—

GOLD.

	Pieces.	Value.
Double Eagles	40,470	$890,400 00
Half Eagles	23,725	118,625 00
Quarter Eagles	95,864	239,660 00
Gold Dollars	582,955	582,955 00
	743,014	$1,750,640 00
In Bars	. .	3,515,236 87
		$5,265,876 87

CALIFORNIA GOLD FIELDS.

CAPITAL INVESTED IN CALIFORNIA WATER COMPANIES.

The following table shows the amount of capital which is invested in some of the water or fluming companies in California.

Bear River and Auburn Water and Mining Company; Robert Rodgers, D. O. Mills, R. T. Brown, C. H. Rockwell	$650,000
Wyandott and Feather River Water Company; A. L. Williams	300,000
South Fork Canal Company; B. F. Keene, J. A. Reed	500,000
Natoma Water and Mining Company; A. P. Catlin, L. B. Brooks, A. T. Arrowsmith	200,000
Gold Hill Canal Company; (of El Dorado county,) W. H. Smith	10,000
Weaver Creek Mining and Ditching Company; S. P. Daggett	30,000
Tuolomne Water Company; R. T. Brown, D. O. Mills	275,000
Cedar and Indianville Water Company; John G. Farrish, Richard Dickson	30,000
Rock Creek Canal Company; E. N. Strout, or C. Fitch	57,600
Georgetown and Pilot Creek Company; S. S. Brooks	60,000
El Dorado Water Company; C. H. Rockwell	40,000
Coloma Canal Company; S. S. Brooks	42,000
Sears' Union Water Company; A. L. Williams, Miles Hollingsworth	15,000
Bradley, Berdan & Company; L. Bradley, D. G. Mills, E. C. Springer	150,000
Salmon Falls and Negro Hill Canal Company; Orlando Jennings	25,000
Yankee Jim Union Water Company; Robert Rodgers, C. H. Rockwell	128,000
West Branch Feather River Company; Dorville Bequette	200,000
Total capital invested	$2,746,600

THE WATER COMPANIES' CONVENTION.

A convention of those interested in Water Companies was held at Sacramento in October. In speaking of the difficulties under which the interest of the water companies suffers, the President, Dr. Bradley, says:

Among them are those arising from persons coming into the valley of a stream—we having previously taken the water at a point above, and quietly enjoyed it for a length of time—and demanding of us the water, not for the purpose of washing in the bed of the stream, but to take into their ditches, which are similar, but subsequent to ours, to be conveyed to the banks and ridges below: upon their demands being refused, they have marshalled their forces, cut away our dams, and taken our water by the strong arm of their physical power.

Other difficulties have arisen from persons coming into ravines and channels which we have previously occupied as parts of our lines of communication, taking up claims and taking our water to wash them, thus filling up our races below with their tailings, claiming it as their right to do so, and refusing to pay any thing for the use of the water.

Many difficulties have also arisen from various trespassers—such as digging under and undermining our canals and banks, and even digging them up and making wash dirt of them, at times when there was no water in them. Also, raising our gates and drawing our water in the night, perhaps into some reservoir, to be used without compensation the next day.

Persons who, having watched our movements, have taken up lands along our canals, and about our reservoirs, expecting to be benefited by the water to flow therein, have even interposed their objections to our progressing with the work unless we should pay *them* onerous damages, or buy of them the privilege at a high price, or grant them in return some great and important privilege.

Resolutions were passed declaring the importance of the various Water Companies to the Mining interests of the country, and the imperative necessity for the various companies in the State to unite and ask for such legislation as may be necessary for their interest; creating a permanent Board of seven members, to be called the "State Central Board," which is to meet at Sacramento quarterly, and take a general charge of the interest of the Companies.

A NEW MINING CANAL.

We find the following description of a new canal under construction in El Dorado county by the Miners' Consumnes & Deer Creek Company:

The Company's canal will extend from the Consumnes, at a point a little above the Big Canon, to Prairie City and the country adjacent, passing in the vicinity of White Rock Springs, and traverse the great divide between the Consumnes and American river, through a district of mining country at least fifteen miles in length by ten in breadth, and probably as rich in auriferous earth as any other in the State. The length of the canal will be twenty-three miles; but that portion which will receive its supply from Deer Creek, and sufficient for winter use, or for seven months in the year, will be completed in two months, and the remaining portion in six months from the present time. Something like an estimate of the value of the auriferous earth of the district to be washed by this canal, can be made from the fact that in the vicinity of the White Rock House, the earth is now conveyed one and a half miles in wagons and washed in cradles, and in this way pays from ten to fifteen dollars to the man per day. The Company was organized in July, and about the midle of August commenced operations. It has already four miles of the eleven necessary to reach Deer Creek, under contract and progressing; and the remaining sections are to be let to contractors. The work consists of both fluming and ditching. The capital stock of the Company is $100,000. It is confidently expected, however, that $50,000 will be sufficient to complete the work.

YIELD OF THE RIVER CLAIMS.

Some of the results of tunnelling are thus stated:

Some of the indefatigable Companies on the South Fork of the American are now reaping the reward of their patience and unflinching perseverance. Many have not as yet been able to complete their works, so that they could get into their claims, but are expecting to do so the coming week. The El Dorado Company, just below the saw-mill, Union Town, were able to commence working last week, and are doing exceedingly well, taking out frequently as high as $40 to the pan; and this amount is by no means large, when the vast risk, expense of time and money invested, are taken into the account.

A company of men known as the Scott Company, on the Middle Fork of the Consumnes, numbering six men, have turned the river at Scott's Bar, and have been working in the bed of the stream six weeks. Three weeks of the time they run two toms, and averaged $100 per day to each tom; since that time they have used but one tom, with an average of $100 per day. The Company have ground enough to keep them employed for three months longer.

The miners at Parks' Bar on the main Yuba, are doing well. At Perry Wing Dam, the yield for one day was 103 oz.; the Mobile Company's claim yielded 156½ oz. on the same day; the National Company are in the river, and have commenced their strikes. In short, all our intelligence goes to show that the yield of gold from the river will be greater than in any previous season.

At Burton's Bar, the Lynville and Sarah Maria Companies, after trying three years, have the fourth succeeded in getting into the bed of the river. The dividends are $1500 per week to the share. At Long Bar the river mining is a failure, and it is very sickly among the miners. Over $150,000 has been sunk in river work at this place. The damming operation at Owsley's, which cost $65,000, was a failure.

THE TAX ON FOREIGN MINERS.

A great deal of trouble has been caused in the mining districts by the refusal of the Chinese to pay the tax of four dollars per month imposed by the last Legislature upon foreign miners. Every means are taken by them to avoid it, and they often resist by force. When they undertake this last plan, they are apt sometimes to get roughly handled; and at these times there are not found wanting Americans who can only see one side of the question, and in the affrays which have occurred, the Tax Collectors have had not only to fight the delinquents, but also their own countrymen. This makes the situation of the officers very vexatious. A great excitement is raised on these occasions: meetings are held, exaggerated statements made, and resolutions passed of a violent character. In nearly every case of this kind, blame in the matter has been found to rest with this people, and though they may some of them have previously been imposed upon, every means has been taken by the Legislature and by the Collectors to give them correct information, and there is now no excuse for their conduct.

QUARTZ MINING IN NEVADA COUNTY.

There is, perhaps, more capital invested in quartz mining in Nevada county, California, than in any other part of the State. Operations were commenced there at an early date, and have been prosecuted with much vigor. The following details were received by the latest arrivals:

Notwithstanding the many and disastrous failures which have taken place in quartz operations in this vicinity, this important branch of enterprise, we are pleased to observe, is once more looking up, and promises, under present auspices, to become an extensive, lucrative and permanent business. We have now in this neighborhood, four mills in constant operation, night and day, running an aggregate of forty-six stampers, and with a result perfectly satisfactory to all concerned. A fifth mill has just been completed, and will be put in operation as soon as a supply of quartz can be obtained from the company's vein.

We know of no portion of the State where richer or more numerous veins of gold-bearing quartz have been opened than in the vicinity of Nevada City. Two of these are of remarkable richness, unsurpassed probably by any ever yet opened in this or any other country. We refer to the well known Gold Tunnel, and the Wisconsin Vein, situated about one and a half miles east of the town. Both of these veins are now being worked with results which absolutely stagger all sober calculations—$60 per ton being the lowest estimate that can be put upon their average yield—and their extent and continued richness is daily becoming more apparent.

Past reverses, although they may have been absolutely ruinous to some, have nevertheless not resulted in positive loss to a great majority of our citizens who have invested their capital in this description of mining: for the experience thereby gained has been turned to good account in subsequent operations, as recent and actual present results most satisfactorily show.

Among those companies who are greatly deserving of credit for their energy and perseverance in pushing their operations to a successful issue, against the most untoward obstacles, we may mention as conspicuous, the "Wyoming Company," whose works are located about one mile below town.

The company has now arrived at a point where they are likely to realize

their most sanguine anticipations. They have spent the greater part of the past year in opening their vein in a proper manner, which they have finally succeeded in doing at a heavy cost. In prosecuting this work they have pierced the hill where the lead is situated, with a well constructed adit, some three hundred feet in length, blasting almost the entire distance through the hardest description of slate, and intersecting their vein at a point about one hundred and fifty feet below the surface. In addition to this, they have run up two side drifts, opening as many breasts for the commencement of stopeing operations. They have also opened a communication with their old works, about one hundred feet above the adit, by means of which they have secured a constant and free ventilation, a very important point for the successful prosecution of their works. They have hitherto been bringing to the surface about five tons of rock per day; but by means of the breasts which are now opened, they will hereafter be able to double, or perhaps triple this amount, with much less proportionate cost. Their rock is now brought to the mill by an inclined plane, some 1500 feet in length, thereby greatly reducing the previous cost of delivery, which was accomplished by the tedious and expensive method of *hauling*, over an exceedingly rough road of about half that distance.

The vein where they are now at work presents a very favorable appearance; the rockis highly metalliferous, showing considerable gold, in many places much decomposed, and averaging about two feet in thickness. They have followed the vein in the adit about 100 feet, throughout the whole of which distance, it appears to be constantly improving, and presents the most encouraging inducements for a continued and energetic prosecution of the work.

Such results are highly encouraging, and will do much to induce others to embark in similar enterprises, which may now be attempted with far greater confidence and certainty of success than were the early and purely experimental operations which marked with such disastrous results the incipient stages of this branch of mining in California.

The *Telegraph* of Grass Valley says: At a very low estimate, one hundred tuns of quartz are crushed daily in this Valley. This rock comes from leads held as fortunes by their lucky owners—Lafayette, Lafayette No. 2, Gold Hill, Massachusetts Hill, Daisy Hill, Osborn, Ben Franklin, Ophir, Tippecanoe, etc. Within the last week thirty tons of rock from a new locality, Cincinnati Hill, has yielded, at the Empire Mill, over three thousand dollars, and the most experienced in this business among us, consider these things but a foretaste of discoveries yet to be made. Three mills are now in the course of erection, capable, when completed, of crushing one hundred and fifty tons of rock daily.

In the department of coyote mining, we are not greatly, if any, behind our famed neighbor, Nevada. Within a mile and a half of this village, are not less than five distinct deep leads, some of which have been worked with profit for more than a year, while others have yet been hardly prospected. Tunnels have been run into some of these leads at a large expenditure, and we know of one company prosecuting a work of this kind at a heavy cost, which has paid every cent of this sum by occasional pans of dirt scraped from the bed-rock and washed in a ten gallon tub.

AUSTRALIAN GOLD FIELDS.

Notwithstanding statements which have repeatedly been made of the decline in the yield of gold in Australia, such does not yet appear to be the fact. In the Colony of Victoria it has greatly increased. The Melbourne *Argus*, of August 18th, a respectable authority, contains the following statement:

Symptoms of a marked improvement in the yield of our gold fields have again begun to make their appearance. Fresh spots have been discovered which give indications of extraordinary productiveness, and even the old ground has been so much more prolific as to yield for the last week, as well as the one

preceding, more than has hitherto made its appearance for any one week of the last six months.

Since the close of the month of July, the remittances per escort have been very great. The first week of the month of August showed an amount superior to any this year, and though the following or second week of this month is not so productive, it also presents a satisfactory result. The amount received from the different mines for the portion of the month now expired, is as follows:

GOLD RECEIVED PER ESCORT SINCE JULY 30, 1853.

Week ending,	Bendigo and Mount Alexander.	Ballarat.	Ovens.	McIvor.	Total.
August 6 .	55,617	4,749	5,205	5,187	70,700
August 13 .	33,506	5,302	——	5,687	44,495

Should the next two weeks average as much as the last two, the month of August will then show a result superior to any month of this year, and so afford confirmation to the belief that the mines are giving promise of again becoming very rich and productive.

The only diggings in operation at this time last year, were those of Mount Alexander and Ballarat; the Ovens and McIvor having been since discovered. We therefore compare the yield of those two fields last winter with that of this year:

YIELD OF MOUNT ALEXANDER AND BALLARAT.

	FOR 1852.	FOR 1853.
January	53,608	156,856
February	55,882	142,044
March	61,389	133,655
April	67,556	138,277
May	69,458	124,302
June	108,650	106,146
July	282,546	165,779

From these statements it will be observed that the amount for July received per escort, exceeds any other month this year; and that the amount shipped for that month also bears a favorable average as compared with any of the others.

GOLD RECEIPTS AND EXPORTS FROM MELBOURNE.

The following is a statement of all the gold which came to Melbourne by escort in seven months of 1852 and 1853, and of the amounts exported thence in the same period:

	Gold received per Escort.		Gold shipped.	
	1852.	1853.	1852.	1853.
January . .	53,594	186,615	160,477	266,868
February . .	56,142	172,329	152,560	189,675
March . .	62,026	169,654	107,406	166,428
April . .	68,041	170,427	92,512	101,688
May . .	77,247	116,812	94,075	213,319
June . .	116,009	122,695	152,242	153,865
July . .	320,218	198,007	179,412	202,126

YIELD IN NEW SOUTH WALES DISTRICT.

The gold fields of New South Wales, though less stupendous in their results than those of Victoria, have never, since their first discovery, ceased sufficiently, and in many instances brilliantly, to remunerate a large mining population, while the wealth of the Colony has been still further increased by considerable amounts of gold and money obtained by inhabitants of New South Wales in the Victoria gold fields. Ample evidence of this fact is again furnished by the *Sydney Gold Circulars* from the 4th to the 18th of June. In the week ending the 4th of June, 2161 ounces of gold, valued at about £8000, reached Sydney from the various New South Wales diggings, which may be enumerated as follows:—Bathurst, Sofala, Yass, Bingara, Tambaroora, Avisford, Mudgee, Braidwood, Bell's Creek, Major's Creek, Goulburn, Murrurundi, Cameron's

Creek, Tamworth, Hanging Rock, Rocky River, and the Ovens, where new and rich placers had been discovered. In the week ending June 10th, the arrivals amounted to 5,325 ounces, valued at £15,000; in the week ending June 18th, 1,446 ounces of gold came to Sydney, together with £2,864 in cash. The total of the exports of gold since the first discovery, amounted to 1,332,741 ounces, which, at 70*s*. per ounce, represent a capital of £4,664,593. It is of course impossible to estimate the amounts taken out by passengers, either on their account or for others.

Among the gold fields mentioned above, are several new diggings which have never, or but very slightly, been mentioned in England. The first among them is Nuggetty Gulley, near the Ovens, where the gold, we learn, is distributed capriciously, and success has consequently been unequal.

The working of the alluvial diggings and the washing of the soil, engaged the attention of the diggers in almost all the fields. Formerly, in the majority of instances, washing would not pay, for it was necessary to carry the "dirt" up-hill and down-hill for the distance sometimes of a mile or two, in order to bring it near the water. But within the last month, water companies have established themselves at almost all the gold fields, which, by the aid of pipes, and in some instances with the help of machinery, conduct the water to the places where it is most wanted. These companies, it is said, are successful, but their success would be greater, if they could command a sufficiency of labor to supply the wants of all applicants. They offer 15*s*. per day, and rations, but they are unable to procure the hands they want. A hundred miles of gutta-percha tubing, and a dozen small steam engines, would, under these circumstances, meet with a hearty welcome at the diggings.

MINING OPERATIONS DURING THE WINTER.

The present winter has been one of the most severe ever known in Australia. From heavy and continued rains the rivers have overflowed, cutting off the island communications; the roads, bad enough in the best weather, have become impassable, converted into quagmires. A large tract of country round Goulburn is now under water. In the Bathurst district there has been a fall of snow—a very unusual phenomenon in the plains; in the Blue Mountains it has lain two feet deep, and the cold on the higher elevations has been intense. The mails have been every where delayed, in some places stopped altogether, and the arrivals and departures of the gold escorts have been very irregular. The season has been most unfavorable for the the diggings. It has suspended work or made it very difficult, and, by increasing the cost of conveyance, run provisions up to excessively high prices. In some places the miners have given up operations entirely, preferring to wait till the weather improves; in others, they are glad if they can make enough "to clear their teeth," or cover the cost of living.

Of the inclemency of the winter, even in the vicinity of Sydney, the *Herald* remarks,—

Since the year 1835 we have never known so severe and unhealthy a winter season as the present; and during a residence of 30 years in the colony, we never remember to have been so long without a tempest, or at least electricity. This year the frost has been so severe in some parts of the district as not only to kill the orange trees, but even to blight many of the forest trees; and upon the hills, where formerly the fruit was never touched, much is now frost-bitten. We are at present suffering much from catarrh, sore throats, and severe colds.

But little intelligence of general interest can be gathered from the more recent reports from the gold fields. From the Turon it is stated that a dull monotony pervades all classes; the repeated floods, combined with the high price of provisions, are thinning the population, which is every where fluctuating. At Mount Alexander many continue to reside, though they cannot work, in order to retain the wet "claims" till summer; should it be a dry one, sanguine hopes are expressed as to the yield. In the mean time robberies have rather

increased, in many cases accompanied by violence. At Bendigo there is a strong agitation getting up against the payment of the license fee, and the police force has been increased by 100 men from Melbourne. It is alleged if the fee were reduced to 10*s.* a month very few would evade it, and those few would find the general feeling against them for doing so. It is not at all improbable that in the course of the present year the fee will be reduced on all the gold fields, both in New South Wales and Victoria. In Melbourne, on the 15th, there was a rumor of a new and rich gold mine having been discovered in the Black Forest, but no one could vouch for the truth of the report.

EXPERIENCE OF CALIFORNIANS IN AUSTRALIA.

The following extracts are from a letter of a Californian, who had been induced to visit Australia. They present a highly colored picture unfavorable to that distant country:

Having been induced to try my luck in Australia, by reading the bright and glowing reports given of its mineral riches, and being once again in California, I will give the result of my Australian experience and observations. The distance from Melbourne to the different mines varies from 80 to 200 miles. The roads are level, and very dry and dusty in the summer, and in winter wet and boggy. The country presents a monotonous sameness of appearance. The water is very poor and scarce during the summer, the rivers Loddon, Serpentine, Campaspie, Coliban and others, being then only stagnant pools.

The water for use in the mines generally has to be brought from a distance of some miles, and is sold at a shilling a gallon.

The gold is found in the gullies, the hollows between the hills being so called; it is also found in what are called the chalk hills. There are no bold mountains —no steep, narrow ravines or gulches, nor large quartz formations; but the Victoria mining region presents an entirely different appearance from that of California, there being not the least resemblance between them. The gully diggings average about fifteen feet deep, thirteen of which no water penetrates; it is a deposit of burnt stuff and hard clay; making the digging so hard, that good picks require repointing after sinking a couple of holes. The bottom, or washing stuff, averages about one foot deep. The chalk hills sinking varies from thirty to one hundred feet in depth, with about six inches washing dirt. The holes are worked by gads (a sort of steel wedge) and sledge-hammers. I have seen holes sunk in this way 80 feet deep, without a color of the dust obtained to pay for the toil. This is often the case—the gold does not run in leads, but in patches, so that there is about a hundred blanks in the great Australian lottery. There being no water in the principal mines, no washing can be done on the ground in the summer season; in the winter, ditches have to be dug to retain the water, or it is dipped from old holes; there is no chance for sluicing, and no gold found in the rivers.

The majority of the miners find it difficult to make their expenses. Twelve feet square is now considered a claim; but if it should happen to be a rich one, you will have to guard and protect it, for others will work night and day to work your bottom out, if they can; or steal your dirt; if you are supposed to have gold or cash about your person, you are likely to be robbed the first favorable opportunity.

In speaking of the Australian mines, I speak of them as I found them, not as they were. The new diggings have, so far, proved failures, while the old ones (Mt. Alexander, Bendigo and Ballarat) are considered well worked out. The yield of gold has decreased in proportion to the increase of miners. The yield of the Victoria gold fields, according to the most authentic accounts, reached their climax last October, for which month the yield was 350,000 ounces, since which time it has gradually decreased to 170,000 ounces for July; and from the best information the miners number full 180,000. There is a feeling of discontent pervading the mining population on account of various existing grievances.

CONRAD HILL MINE, NORTH CAROLINA.

The Conrad Hill Mine is situated in Davidson county, 6 miles from Lexington, 3 miles west of the main road to Raleigh, and 19 miles north of the Yadkin River, at an elevation of some 180 to 200 feet above that river.

For several years past, the veins belonging to this property have been the theatre of considerable mining operations. The western portion comprise 150 acres, of rectangular shape; and there are five houses on it, one of which has been used as a boarding-house for miners, it being about a quarter of a mile from the hill. There are three veins of ore traversing this hill, parallel on their out-croppings, but approaching each other on their descent.

The first, or west vein, dips 45 deg., with a little variation; while the second or middle vein, and the third or east vein, seem to change their angle of dip to 45 deg. near the 40-feet level; their dip at the out-cropping, and for some distance down, is 40-deg.

Near the 40 feet level a branch of vein No. 2 runs with the vein No. 1 for a small distance in its descent, but unites with its main vein again near the adit level.

The third vein begins to incline towards the first vein some 10 feet below the 70 feet level.

They are all of the same character as it regards contents, viz., auriferous quartz, sparry iron ore, and sulphurets of copper, and iron in a state of hydrated peroxide, as far down as the deepest workings, in which but a very slight change, as regards decomposition, is perceptible. Sulphurets of copper, changed into blue and green carbonates, occur near the surface, but at great depths the sulphurets of copper predominate.

The matrix of the veins is quartz. Gold is found in abundance in the softer decomposed substances, at the depth of 96 feet. These veins are from 3 to 6 feet. The cross vein carries gold in coarser grains; it consists of a harder and crystalline quartz. The expense of mining and raising the ore in the present workings is considerably more than when a correct system is laid out; at present the cost is about 5 cents the bushel.

The capacity of the mine, for the production of copper ore, is perhaps one that will in a series of years be the the most profitable to the Company.

In the different veins yellow sulphurets and blue and green carbonates of copper occur in the greatest abundance, and the supply in some sections of the property is equal to that found in the whim shaft of the North Carolina Company, in Guildford county.

GOLD DEPOSITS IN SOUTH CAROLINA AND GEORGIA.

Deposits are more numerous in the States of South Carolina and Georgia than in Virginia or North Carolina, owing most probably to the fact that the slates of the former States are softer than those of the latter. Extensive deposits occur in the upper districts of the State of South Carolina, and in the State of Georgia, none of which, however, can compare with the Californian or Australian placers. From the desultory and irregular manner in which they have been worked, it is impossible to obtain any reliable statistics of their yield. It is generally conceded that a deposit yielding 10 cents to the bushel (100 lbs.) will "pay to work." A dollar a day to the hand, over and above expenses (which, where negroes are employed, should not exceed 50 cents per hand), is considered a fair business.

Mines in which the gold is extracted from the solid rock should be properly divided into classes; those in which the precious metal is found disseminated through the slates or beds between them, and called by the miners "slate mines," and those in which the lodes are true veins. The ores of the slate mines are usually poor, though the poverty of the ore is frequently compensated for by its abundance.

The gold bearing veins of the Southern States are generally quartz, associat-

ed in most instances with either sulphuret of iron or copper, or oxide of iron—sometimes one, sometimes two, and occasionally all three of those substances occurring with the quartz. In fact it may be safely asserted that sulphuret of iron invariably accompanies the gold of the Southern veins, in the majority of instances itself being the matrix of the precious metal. In some instances the gangue is altogether copper pyrites.

The direction of the veins is almost generally N. E. and S. W., or varying a few degrees from it, and their dip or inclination to the horizon rarely less than 60 degrees. As with all mineral lodes, their width is variable; from the thickness of a knife-blade to 40 feet, as in Nott's mine, in South Carolina.

The system of gold mining in the Southern States, with a few exceptions, is most deplorable. The mines in very many instances are nothing but open-cut workings, that is, simply immense ditches, open at the top, and liable to fall in at any moment, which they often do. It is a common practice to let out portions of a vein, sometimes not more than 12 feet square, to persons totally ignorant of the business. The consequence is that there is no system, much less any concert in the workings, and certainly no view to future operations.

RUSSIAN GOLD MINES.

The following is a summary of the production of gold in the Ural Mountains and Siberia, under the control of the Russian Government:

Year.	Poods.	Sterling.	Year.	Poods.	Sterling.
1829	314	£628,000	1840	585	£1,170,000
1830	378	757,000	1841	681	1,362,000
1831	396	772,000	1842	950	1,900,000
1832	410	820,000	1843	1283	2,566,000
1833	408	816,000	1844	1341	2,682,000
1834	406	812,000	1845	1386	2,772,000
1835	413	826,000	1846	1730	3,460,000
1836	426	852,000	1847	1825	3,650,000
1837	469	938,000	1848	2000	4,000,000
1838	524	1,048,000	1849	2050	4,100,000
1839	525	1,050,000	1850	2175	4,350,000

The Russian pood is equivalent to about £2000 sterling. The duties on gold in Russia, on the produce of the private mines, are heavy, varying from 12 to 24 per cent.; in Austria they amount to 10 per cent.; in Brazil to 5 per cent.

PRODUCTION OF GOLD IN THE BRITISH ISLANDS.—BY J. CALVERT.

(*Proc. Brit. Assoc.*, 1853, *fr. Athen.*, 1104.)

From his own exploration, from researches in various works, and from communiciations, Mr. Calvert stated that gold was found in forty counties in the British islands, and over an area of 50,000 square miles. He thus classified the gold regions:—The West of England, North Welsh, Mid-England, of Northumbrian, Lowland, Highland, Ulster, and Leinster. The west England region might be divided into three districts—Cornwall, Dartmoor and Exmouth, or West Somerset. In Cornwall, the tin-streams which were of the same composition as gold-diggings, had long been known to contain nuggets and coarse dust, or hops of gold, but had only been slightly worked by Sir Christopher Hawkins, at Ladoch. The largest Cornish nugget was not worth more than about ten guineas. The Cornish districts were very rich in gold. The Dartmoor district contained gold in its northern and southern streams. A miner, named Wellington, got about 40*l.* worth of gold, at Sheepston, and Mr. Calvert had obtained gold from the granite by this process. In the West Somerset were four companies for working gold ores. From 55 tons of Poltimore ores, 102 ounces of gold were lately reduced, being at the rate of 16 dwts. per ton, or twice the rate of the St. John del Rey ores. The West Somerset district pro-

bably embraced gold sites at Combe Martin and the Mendips. The North Wales district might embrace all the western counties of the principality. There were no reported river deposits, but gold ores had been worked at Carnhusian, Isso, Berthllwyd, Dolfrwynos, and other places. The Northumbrian regions embraced Alstone Moor; but the chief gold field was in Westmoreland and Cumberland. In the Goldscoop mine, gold had been found in the copper for ages, and he (Mr. Calvert) had discovered it in many of the ores and rivers of the district. He showed specimens from High Treby, Caldbeck Fells, the Buttermere and Crumwick-road, Borrowdale, Buttermere, Bassenthwaite, and a fine lump of gold gossan which weighed originally 57 oz. The south of Scotland district had only been worked for its river deposits in Clydesdale and Nithsdale, but in his (the lecturer's) opinion, it extended throughout the lowlands. Gold was found in about forty brooks or gullies, and all of the miners have gold for sale, obtained in their holiday excursions. Mr. Calvert mentioned that in the manuscripts of Queen Elizabeth's time, the diggers relied on keele, a reddish earth, as an indication of gold, and the miners do now. He had seen it also in Westmoreland, and had recognized it also in Australia and elsewhere. He found gold in the Lowther Burn, Long, and Short Cleuch Burns, Mannock Water, Kepple Burd, Glengomar, Elvanwater, Goldscour, and other places. At Wanlockhead he saw gold in the midst of the town. At one place the miners, two years ago, got gold, which at Glasgow they sold for 42*l.* Gold was reported in Perthshire, Fifeshire, Sterlingshire, and Linlithgowshire. The Highland gold regions were unexamined. Gold localities had been reported in Aberdeenshire and Sutherlandshire. The Wicklow diggings were only shortly referred to. It appeared, by returns obtained from the Dublin goldsmiths, that the present supply of the peasantry was about 2000*l.* a year. In Ulster the peasantry worked the aura or gold mountains in Antrimshire, and the Mayola streams in Londonderry yield gold. The yearly produce of gold in these islands was now about 5000*l.* a year, which might be largely increased. The number of gold-bearing streams known was one hundred. Gold had been found in nearly all the clay-slate districts. Many of these were worked in the Middle Ages, and probably also by the Romans. Gold, in ores, was found associated with silver, lead, copper, iron, and zinc; with quartz, granite, slate, oxide of iron, sulphate of iron. These ores have been worked of late only in Devonshire and Merionethshire. The river deposits were rudely worked by the miners or peasantry in Wicklow, Lanarkshire, Antrimshire, and Devonshire. The washing of gold-stuff in our home districts was very rude, and not equal to that in Australia, nor had there been for a long time any deep workings. Many rich gold ores were thrown away, and much metal was produced from which the gold was not refined. The only two gold fields which had yet been worked had yielded considerable amounts. The Lanarkshire district from a quarter of a million to half a million, the Wicklow above 100,000*l.* The largest known nuggets were 3 lb. from Lanarkshire, and others of 2½ lb. from there and Wicklow. The importance of attending to this branch of the national resources was strongly urged. Mr. Calvert concluded by stating, that he considered the clay-slate formations of Canada would soon be discovered to be a vast gold-field.

IMPROVEMENT IN GOLD WASHERS.—*Patented by* John H. Ward, *Sonora, California.*

The nature of my invention consists in the method of arranging the several parts, one over the other, and operating them, so arranged, as to perform the whole washing and separating process, in a compact machine, occupying very little space, easily transported, and at great saving of water.

Claim.—"I do not claim washing or agitating the mass or earthy matter containing the gold, in a tub, box, or cistern; nor do I claim simply washing the earth without a current of water: but what I do claim is, the employment

of the reciprocating perforated trough, armed with cutters or breakers, in combination with the sieve and decanting trough, arranged beneath the reciprocating trough; and in combination with said reciprocating trough, I claim the percolating plate, arranged above the same."

IMPROVEMENTS IN OPERATING UPON AURIFEROUS QUARTZ, CLAYS, AND OTHER MINERALS, PREPARATORY TO, AND IN ORDER TO ACCOMPLISH THE SEPARATION OF THE GOLD AND OTHER METALS, ALO IN MACHINERY OR APPARATUS FOR EFFECTING SUCH IMPROVEMENTS.—*Patented by* G. H. Bursilt, *Islington, England.*

The first part of this invention consists in the employment of a caustic ley for cooling or disintegrating auriferous quartz or other metal bearing mineral, the hardness of which is attributable to silica or other matter having when hot an affinity for caustic soda or potash, and in the subsequent purification of such ley, to enable it to be repeatedly employed.

The second part of the invention relates to the treatment of earthy matrices containing gold or other metal, and composed chiefly of alumina, lime, &c., these the patentee crushes and submits to a washing operation, in which the water is admitted beneath the ore, and made to flow gently upward; and he finally uses acid to effect the solution of the matrix.

The third part of the invention consists in the use of a readily fusible alloy of bismuth, tin, and lead, or an amalgam of the same with mercury, for the purposes of securing gold and silver from the mineral with which they are associated without smelting, properly so called; that is, without the actual fusion of the matrix.

The fourth part of the invention consists in a method or means of bringing ores forcibly in contact with mercury, the degree of force exerted being regulated according to the height of a column of mercury, through which the ores in a state of meal, or finely granulated, are caused to pass.

GOLD MINES IN CHIHUAHUA.

Placeres, or deposits of gold sand, are said to exist on the Gila River. There is, however, no authentic information in this respect, and the gold of Mulatos as well as of Jesus Maria, is taken by a real mining process from the rocks *in situ.*

Mulatos.—This place is situated in the extreme southwestern corner of the State, 120 leagues distint from the city of Chihuahua. Its mines were very rich at the time of the Spaniards, but have been abandoned since their expulsion. From time to time, however, some poor people make a living by collecting a small portion of the precious metal. At the present time, by far the greater part of the gold and silver obtained from the mines of this country is gathered and extracted by this kind of mining squatters, who can only make use of the very poorest means of which the art of mining and of metallurgy has to dispose. In Mexican miners' terms they are known under the name of *gambusinos.*

Jesus Maria.—Its gold mines have, at times, been very rich. The *Mina del Rosario*, even lately, has yielded $10,000 of gold every week. At the present moment it is abandoned. In general, gold mines are thought less valuable here than silver mines. They are less constant, the stealing of the ore is more easy, and their failure may, in a short time, destroy the capital invested.

JOURNAL OF COPPER MINING OPERATIONS.

The most extensive mining operations in the United States are carried on in the Lake Superior mineral region, which presents several distinct districts, in each of which are several mines. In noticing them, hereafter, we shall endeavor to do it by districts, beginning at the extreme west or Ontonagon range, and including likewise, those on the Canadian Shore. But emigration is already extending westward of the Ontonagon region of Lake Superior, of which a recent writer says:—

Explorers have already pressed westward of the Ontonagon range, and are now taking possession of the newly explored trap range extending from the river Bois Brulée, about twenty-five miles above its mouth, to near Left Hand river—which is believed by the most competent judges to be as rich in copper as the famed Ontonagon range. So you see, Mr. Editor, that your Copperdom has overleaped its former boundary, and extends to the extreme western end of the lake, a region which abounds not only in copper, but iron, and probably silver also, for nature seems to have been so profuse as to scatter these valuable minerals, broadcast around the whole lake country. I speak of the south side, but the richest portion of all copperdom is believed to be, and I have no doubt correctly so, on the north side of the lake, in the Territory of Minnesota, extending from the British line to Fond du Lac, a distance of say 150 miles. This region, which is but little known, already reveals to the explorer the richest indications and specimens of copper, iron and silver—giving assurance of the richest "diggings" yet discovered on the lake. This California of dormant wealth is in the possession of a small number of Chippewa Indians, who cling to it with all the affection of the red man for his fatherland. Never will these children of humanity consent to lift their birch canoes from the great lake, and turn their faces from its sparkling waters, where they have so oft sported in the calm, and buffeted the storm. It is the theatre of their proudest war tales, and most cherished legends. Never will they sell the privilege of bathing in its waters, or setting their nets upon its shore.

THE ONTONAGON MINING RANGE.

The Ontonagon, which is one of the largest streams emptying into Lake Superior, is one hundred and fifty feet wide at the mouth, and for the first five miles upwards, has a depth of fifteen feet; there is, however, a bar at its mouth, which has usually not more than six feet of water upon it, consequently vessels and steamers are compelled to land their cargoes by scows or lighters, and their passengers by small boats, as at Eagle River.

The river is about eighty-five miles in length, and beside the main stream has an east and west branch of about 50 miles in length each. The descent of the river is nine hundred feet, and the area of country drained by it is about thirteen hundred square miles. Its general course is N. N. W.

Going up the river you pass through a pleasant and fertile country—you pass boats of 20 to 30 tons, laden with freight up, and with copper down. After four or five hours sail you are delighted with the view of the gold mountainous range, on which you learn the mines are situated. Thirteen miles from the Lake you arrive at the landings of the mines, and are surprised to see huge piles of mass copper lying upon well built docks, with apparatus for handling

with ease four and five tons weight. You pass up well constructed roads, expecting to find huge rocks and stupendous precipices to climb over, but you rise gentle slopes, and soon come upon moving fields of grain and oats—comfortable houses—the puffing of engines, and are surprised to find yourself in a village of 400 people. This is one of the mines, one and a half miles from the river—all around under cultivation.

First in extent and production is the Minnesota Mine, working about 220 men, and producing about 50 tons 80 per cent. copper, monthly. On the same location as the Minnesota, is the Lake Superior Mining Company—a work recently commenced—now working 25 men with the same system of veins as the Minnesota. They have also cut a new vein on the north side of the bluff that is said to equal any thing in the country. East of this is the Flint Steel Company—a new mine opening with very flattering prospects. South of the Minnesota is the Penisular Mine, working at present under some disadvantages from irregular veins. Near this is the National Mine, a new work which promises well, if they find the Minnesota vein, which they are cross-cutting for. West of the river is the Forest, Glen and Shirley Mines, all well situated for mining and producing some copper.

Minnesota Mine.—A recent letter from the Secretary of the Minnesota Mining Company, makes the following statements:—

We have held on to our copper, and the consequence is that the market is now firm at our price (29 to 30 cents), and is beginning to be active, and as we have the only supply of any consequence of Lake Superior copper, the present prospect is that we shall soon dispose of our whole accumulated stock, which at this time amounts to more than enough to pay the contemplated dividend of $30 per share. You may rely upon it, that as soon as the Directors can make use of the paper (among the best in the market) received for sales of copper on terms which will not subject them to the censure of stockholders, the dividend of $30 will be paid.

I trust that my explanation will be satisfactory. I can assure you that the prospects of the mine and the value of the stock as an investment were never better than at this moment.

The territory of the Minnesota is now 1,315 acres, in addition to a tract of 115 acres, in dispute between it and the National. Three well marked veins extend across the location—two of them in its widest part. But one of these has been wrought to any extent, and that but for a few hundred feet. It is the famous Minnesota vein, now yielding from 60 to 70 tons per month, of 80 per cent. metal, and likely to increase rather than diminish in productiveness for generations to come.

The National Mine.—This mine covers two and a half sections of land in Township 50 north, of range 39 West.—Its present scene of mining operations is upon section sixteen, southwest of the Minnesota, upon the trap range, and about half a mile distant from it. The National Company organized, and on the 4th day of September, 1852, commenced work by the erection of buildings. During the autumn the company commenced their operations under ground, and they have now completed No. 1, shaft of 90 feet depth, No. 2, shaft of 130 feet depth, an adit level extended eastward on the course of the vein 720 feet, and 220 fathoms of stopeing. They have also extended a cross cut northward in the supposed direction of the Minnesota lode, 107 feet, the main wall of which has not as yet been reached. The Company have at no one time employed above 60 men, and at times the number has been as low as 20. They have erected eight comfortable buildings, including a store and storehouse, and two horse whims, and have called in an assessment of $2 00 per share. In prosecuting the above under-ground work, they have taken out thirty-five tons of barrel and mass copper, and ten tons of stamp work, for the reduction of which they have as yet no machinery. They have shipped to the east 21 tons of copper in masses and barrel work, and had above ground on the 2d of August.

fourteen tons, chiefly in masses. It will be seen therefore that the yield of the mine, though in its first year, has more than paid the expenses of working it.

The vein lies several hundred feet above the Company's buildings, and the road by which the copper will be sent away. The mine, therefore, will be relieved of surplus water by drainage through the adits, one of which enters the shaft one hundred feet below its mouth, and another about to be commenced some three hundred feet below. The waste rock, stamp work, barrel work and masses, will be discharged by trams through the adits, instead of being lifted to the surface by the expensive process of horse or steam whims. When the necessary number of shafts are sunk to the first level, all perpendicular hauling by whims will be dispensed with, as well as all pumping of water.

Norwich Mine —The following statement respecting the Norwich, Sharon, and other mines, was made a short time since by the mining captain, Mr. Thos. McDonald:—

The Norwich is looking very well, and the long adit is through to the vein, and we have started the levels east and west on the vein. The stopes above look well, and we have thrown down upwards of 30 tons of mass copper; 400 feet west of shaft B. is McDonald's shaft, which looks well—stamp and barrel work; 100 feet south a new discovery has been made, which is a very rich vein of stamp work, quartz and copper, well defined. The shipment of copper this summer amounts to 30 tons of mass copper.

The Sharon Mine.—The Sharon mine is working 12 men and 8 mines, and is the best show on the western side of the Ontonagon River. So far as it is proved, it is rich with stamp and barrel work; there is some barrel work already for shipment. The houses are all built, and all necessary preparations made to work a full force this winter.

The Derby Mine.—The Derby mine looks well, and the south vein will turn out considerable copper this winter. The prospects of the mines in general west of these mines, as far as the Agogetic Lake, look favorable.

Forest and Glen Mines.—The Forest and Glen mines are improving rapidly. The show is much better than has been heretofore. The Glen is a new mine.

New Mine at Ontonagon.—A company has recently been organized at Detroit for mining on the S. E. and N. W. Quarters of Section 30, Town 50, N. Range 39 West. This tract of mineral land is favorably situated near the Ontonagon River, contiguous to the Forest Location, and after a careful examination, the company feel confident that they have a promising vein on which to commence work, and have already sent forward supplies for winter operations. This location is in the line of the Minnesota, National and Forest veins, and promises to be valuable.

Geo. Sedgwick, Henry Foote, H. Frigille, E. G. Fuller, and Henry Acker, are Directors; and Geo. Sedgwick, President, and Henry Foote, Secretary and Treasurer,—office at Detroit.

Ohio Trap Rock Company.—The first report of this Company has quite recently been issued. The President is Joshua Hanna—the Treasurer, Wm. K. Hart. The report thus proceeds:—

In presenting our first published report to the stockholders, the Directors deem it proper to give a brief history of the Company's progress, and some of the causes which operated to prevent a more rapid development of the mine. During the summer of 1845, the location was made on a permit from the Secretary of War. In 1846, a small party of explorers commenced an improvement on the southeast portion of the location, spending a portion of the fall in looking for copper. At this time, but little progress had been made in what is now known as the Ontonagon Range. Two north and south veins were discovered, charged with small particles of copper. On these veins two shafts were sunk. In the spring of 1847 explorations were again resumed west of first improvement.

and two east and west veins were discovered, which were deemed worthy of trial. Capt. Wm. Stevens, then in the employ of the Pittsburgh and Boston Mining Company, was employed to take charge of the mine, and continued in the Company's services for over two years, working from eight to twelve men, during which time he sunk two shafts on one of the veins; No. 1 shaft, 180 feet; and No. 2 shaft, 40 feet. The veins in these shafts varied in appearance, width, and product (as other veins do). For some 60 feet of the first 100 feet their yield was rich stamp, with some barrel work. He also drove an adit some 120 feet, in which, meeting with a cross-course, he lost the lode, and followed a feeder some 60 feet. This error prevented his connecting with No. 1 shaft before warm weather, when, owing to the depth of the shaft, and want of proper ventilation, he was compelled to suspend operations therein until the following winter; during this time, he commenced a drift in the other vein, which he drove 60 to 70 feet, with flattering prospects.

Want of confidence in the agent, and the general depression of the copper interests during the following year, prevented the Company from working more than 4 to 6 men, a portion of whom were employed in further explorations, which resulted in the discovery of the third vein, running parallel with, and about 300 feet south of, the first vein, in which several Aztec pits were found, in one of which a well defined vein of 30 inches was exposed, well charged with stamp copper.

The Directors resolved to renew the work with vigor, and prove up this new vein, and for that purpose secured the services of Capt. Joseph Buzzo, an experienced miner and engineer, who took charge of the mine in October, 1851, and commenced a shaft in one of the pits, and prosecuted that and the other shafts on the same vein, with much energy and success, until the past spring, opening a large amount of ground, much of which will pay wellf or stopeing. On examining the drift commenced by Capt. Stevens, in the second vein before alluded to, Capt. Buzzo believed it worthy of further trial, and commenced a shaft termed "Park's Shaft," which has been continued with good prospects of making a paying mine. Within the last month, several masses of 500 to 1,400 lbs. weight, have been taken from a drift running east from this shaft.

During the fall of 1852, a new vein was discovered, 400 feet north, on which a trial shaft was sunk last winter, with such flattering results, as to induce Capt. Buzzo to withdraw a portion of his force from the other vein, and commence another shaft, both of which, and a drift, have been worked with full force to the present time; and when examined during this summer by several of the Directors, presented one of the richest veins we have ever seen.

These facts, together with the loss last fall of a portion of our engine, in the great gale of October 18th, on Lake Superior, causing a delay of one year in the completion of the stamps, induced the Directors to suspend the work for the time being, on the first lode, termed "Indian Diggings," confining their underground work to the new vein, and in "Park's Shaft" and drift, by which means they will be able to keep the stamps employed with rich work.

The result thus far has much more than realized our expectations, and has induced us to materially increase our machinery this season. We will, before the close of the year, have our preparations complete for working twenty-four head of stamps, which we expect to keep constantly employed during the winter.

The Directors entered three thousand six hundred and sixteen acres, for which they hold a patent from government; sixteen hundred and two acres of which they sold to the Colling Mining Co., being off of the east end of the tract, leaving two thousand and fourteen acres, which embraces the entire mineral range for about one and three quarter miles in extent, excepting a very narrow strip of a few rods, on the south line of the location.

During the spring and summer, an exploring party under the direction of a member of the Board, discovered two very promising veins north and east of the present works. Another vein on the extreme northwest corner of the

location, was discovered by an exploring party some time since, all of which are worthy of further examination, when it can be done without interfering with the present work.

In conclusion, the Directors congratulate you on the flattering prospects of the mine, believing that nothing but a good road to the Lake is now required to make the mine productive. Measures have been taken to have such a road constructed. Several other companies in the same vicinity have agreed to unite with us in making a good road, and a competent engineer is now engaged in examining the route. This company have a liberal charter for plank or railroad, under which it is proposed to organize, and be prepared for active work next spring. Until such road is made, we will use the river for part of the distance.

By order of the Board.

JOSHUA HANNA, President.

TREASURER'S STATEMENT.

DEBIT.		CREDIT.	
To Assessments	$54,907 00	By Mining expenses, including supplies, Machinery, &c.	$89,449 08
" Colling stock,	9,500 00		
" Ohio Trap Rock do	15,000 00		
" Land sold to Colling Co.	2,002 77		
To Balance	8,039 26		
	$89,449 08		$89,449 08
Balance due Treasurer			$8,039 26

Wm. K. HART, Treasurer.

September 1st, 1858.

EAGLE RIVER MINES.

The Cliff Mine.—The Cliff Mine, as it is popularly called—its legitimate name being the Pittsburgh and Boston—is one of the most extensive as well as one of the most successful upon Lake Superior. The site of its operations is upon the S W. quarter of Sec. 36. in township 58 North, of range 32 West. The entire tract owned by the Company is not les than six thousand acres. The Company's works are situated about three miles from the mouth of Eagle River, at which point they receive supplies and ship their metal.

The Cliff Company commenced operations in the autumn of the year 1845, and continued their work by making assessments until $18 per share upon their capital stock of 6000 shares had been raised. They have mined with varying success, at times working for months upon a poor-looking vein, and again at other times with splendid success. The mine is now upon a permanent basis, and beyond any future contingency in respect to yield and richness. The mine has already paid back the amount assessed upon shareholders, and divided $41 per share. The mine is now yielding regularly 100 tons of copper per month, and has reached a depth of 490 feet, the longest level under ground is 2000 feet. There are four main shafts, and five adits. The work of pumping the mine, and of raising the ore and rock, is performed by a steam engine, while another large lever-beam engine, of upright form and of great power, performs the stamp work. The stamps at this mine carry twenty-four heads, and are the most perfect and efficient upon Lake Superior. There are two hundred and fifty men employed in this mine.

This Company has reserved a sinking fund of $80,000 which is kept constantly on hand to meet any exigency which may arise from a season of unprofitable mining, should such occur, so that in all human probability no assessment will ever be made upon their stock.

They had shipped early the present season about thirteen hundred tons of copper in masses, barrel, and stamp work, and the present prospect indicates a large accession to that amount.

The affairs of this Company are managed by A. H. Byerly. The financial department is under the control of H. C. Parke.

Fulton Mine.—The Superintendent of this Mine, Hon. JOHN BACON, arrived from the diggings, bringing with him 5200 lbs. of copper in barrels and masses. This is the astonishing product of forty days' actual underground mining. Mr. Bacon commenced with six miners, and has now on the works about 70 men, miners and surface men, and the work of opening the mine will now go forward rapidly. The Fulton is intermediate between Eagle River and Portage Lake and in a new district, and we look upon this beginning in the centre of an extensive mineral region as important to the interests of many neighboring localities.—*Lake Superior Journal.*

The *North American Mine.*—The North Amerian, next to the Cliff or Boston and Pittsburgh, is the most prominent of the collection. This mine commenced operations in the autumn of 1845, under the superintendence of Mr. John Bacon, and continued work until 1853 upon a vein situated half a mile from their present works, when finding the lode not meeting the expectations of the company as to productiveness, that portion of the work was suspended.

The works of the Company are now carried on upon the "Cliff Vein," which traverses their location for about one and three-fourths miles. The work done upon this vein is as follows:

Shafts	166 feet.
Drifts	250 "
Cross-cuts	78 "
Stopeing	70 fathoms.

From this amount of work the company have shipped, up to August 4, one hundred and forty tons of copper, and have some two hundred tons now in sight. One mass alone, reference to which was made a few days since in the letter of M. W. Kelsey, Esq., agent of the mine, is estimated to contain 150 tons, is of the following dimensions; length 40 feet, height 20 feet, average thickness 2 feet. Upon this immense mass of copper thirty-six men are constantly employed night and day, in cutting it up.

The company have 145 men employed at their new works, and have two steam engines employed in doing the raising business and pumping from the mine, and upon stamp works. They have six horses, as many mules, and four yoke of oxen. They have a domain of 2,500 acres of land, all of which has been paid for out of the assessments made upon the assessable stock. The paid in capital is $20 per share.

The vein not being worked carries principally masses and barrel work, but when more thoroughly opened is expected to yield a large amount of veinstone, or stamp work, the average richness of which is from 4 to 5 per cent.

CANADIAN MINING LICENCES.

By an Order in Council the Canadian Government proposes to grant mining Licenses on the following terms, and directs that,—

On payment into the hands of the Commissioner of Crown Lands, of the sum of twenty-five pounds, that officer be permitted to issue a license to any individual, authorizing him to explore on any unconceded lands within the limits of any such country, or section of country, as he may desire to be inserted, situated within the boundaries of Upper Canada, for Copper, Lead, Iron, Tin, Marble, Gypsum, or Minerals; such license to remain in force for a period of two years, and to authorize the individual in whose favor it is issued to take possession of a tract not exceeding four hundred acres, and not already occupied by any other person, such tract to be in proportion of forty chains front, by one hundred chains in depth; the license holder to report his discovery and selection accurately by letter and by map within six months from the issue of

his license, accompanied by an affidavit made by himself and some other credible person, providing that no counter occupation working exists.

At the expiration of the term of two years, during which the license shall have force, he shall complete a purchase, paying the consideration money in one sum, at the rate of seven shillings and six pence per acre, or failing to do so, he shall be regarded as having abandoned such right to purchase.

As regards tracts in the vicinity of the Upper Lakes, such map shall represent the location desired, conformably to Captain Bayfield's charts of the coast.

THE PERKIOMEN CONSOLIDATED MINING COMPANY.

The officers of this company are George Cadwalader, President; Samuel Wilcox, Secretary; Matthew Rogers, jr. Manager:—Directors, Geo. Cadwalader, David Longenecker, Charles McAlester, Samuel F. Tracy, Robert W. Lowber. Office 73 South 4th, Philadelphia. The second annual report of the Directors was made early in May last, which presents the following statement of the business and prospects of the company at that date:—

At a special meeting of the stockholders of this company, held November 24th, 1852, a resolution was adopted, authorizing the Board of Directors to sell the 10,280 shares of stock, then held by the company, and to increase the capital stock, by calling in an instalment, sufficiently large to pay off the debt, and to defray the expenses of working the mines.

In conformity with which resolution, after obtaining the opinion of counsel, the said stock was offered for sale at par, for ten days, at the office of the company, notice of which was published in the newspapers, and also sent to each stockholder; not being taken within that period, it was placed in the hands of Messrs. M. Thomas & Sons, auctioneers, and sold on the 28th of December, 1852, at the Philadelphia Exchange, to the highest bidders, as per the account sales herewith submitted, the net proceeds of which are credited in the statement of receipts and expenditures.

Since the sale, an instalment of one dollar per share has been called in, payable on the first days of February, March, April and May, 1853, producing in all the sum of $50,000, of which there has been received to the 30th ultimo, $38,716. Twenty thousand dollars of this sum were required to pay the debts of the company, and the balance was used in defraying the current expenses; the amount yet due on the instalment, is $11,284, which will be expended in about three months from this time; it gives the Board pleasure to say, that all the debts of the company are now paid.

The Report of the Manager is also submitted, from which it appears that a period of eight months must necessarily elapse before sales of mineral to any considerable extent can be made; it will therefore be necessary to provide means for the ensuing year, by calling in another instalment of the capital stock.

The receipts from sales of 143 tons of ore, raised and sold during the past year, amounted to $9,989 39.

The President, accompanied by Mr. Tracy, one of the Directors, visited the mines on the second instant, and made a thorough examination of the works, both above and under ground; they were much gratified with the management of Captain Rogers, and agree with him in the statements made in his report, and in the opinion expressed as regards the improvement of the mines in the lower levels.

For the Board of Directors,

GEORGE CADWALADER,

President.

SPRINGFIELD COPPER MINE.

The officers of this company are—

President, John M. Stuart; *Treasurer*, A. J. S. Degrauw; *Secretary* W. E. Caldwell; *Directors*, A. J. S. Degrauw, W. E. Caldwell, Obadiah Bowne, A. A. Valentine, A. B. Hodges, Isaac Tyson, Jr., Baltimore, James W. Tyson, Baltimore.

This mine is situated in Freedom District, Cornwall county, Maryland, 31 miles from Baltimore by railroad, and one and a half from Sykesville. From the report of Dr. C. T. Jackson, who visited this mine, we have taken the following statements:—

While working this mine for iron ore, a vein of copper pyrites, a few inches in width, was discovered near the adit level, 65 feet from the surface, and occupying the lower tide of the iron ore bed. On following this vein downward, it was discovered to widen, with great rapidity, as it descends into the earth, insomuch that at the 96 feet level it has augmented to a thickness of 18 inches, while at the depth of 126 feet, a portion of this lode of copper ore attains to a thickness of five feet. From this level, the miners, under the direction of Captain Stephens, have stoped out five fathoms in length, and five fathoms in height, making twenty-five fathoms in the bed; and the produce of this operation was from 70 to 80 tons of copper ore estimated to yield 20 per cent. of copper. The ore may be regarded as equal to two feet in thickness, of thirty-four per cent. copper pyrites, but it cannot be got out free from mixture with some portions of rock and iron ore, and hence is regarded as a twenty per cent. ore. It may be dressed considerably better than it now is, when you have erected suitable crushing mills and washing apparatus. Captain Stephens, who guided me through the mine, states that the copper ore plunges toward the north-westward, and he proposes to sink a new shaft a few hundred feet from the present engine shaft on that side, for the purpose of reaching the ore more conveniently. This will certainly be highly desirable, since it will enable the miners to dispense with the troublesome winzes which they are now obliged to make in the lower level. It will also enable the miners to ventilate the mine more rapidly, and thus save much time. The iron ore gradually gives place to copper pyrites, which it is believed will soon occupy the whole vein. The rock of the vein, consisting of quartz, filled with particles of specular iron ore, forms the back of the lode, and is regarded by Cornish miners as an excellent indication of a lasting vein of copper ore. The talcose and chlorite slate, much decomposed, forms a sort of "gossan" on the easterly side of the vein. The occurrence of this soft decomposed rock on one side of the vein, has given great advantages to the miners in extracting the ore and in driving their levels; and, owing to this, the work has progressed with an almost unparalleled rapidity. Thus, within the last two years, the shaft of 210 feet in depth, has been sunk in the vein. An adit level, which enters the shaft 66 feet from the surface, and has a tram-road in it for the removal of the ore, and allows drainage to the water raised from the mine, has been made; two regular levels of ninety feet in length have been driven from the shaft,—one at a depth of 96 feet, and the other at 126 feet; a winze of 30 or 40 feet, and stopeing work, 30 feet in length by 30 feet in height, has been executed: and all this has been effected within the uncommonly short space of two years. You have now on hand, dressed for market, at least 80 tons of excellent copper ore, which will yield from 18 to 20 per cent., and a large amount, probably 140 tons, of stamp ore, estimated to contain five per cent., but capable of being dressed by machinery to twenty per cent. copper ore.

You have already sold a considerable quantity of copper ore, which has yielded seventeen per cent., and your mine is now in a condition to yield much larger returns than have thus far been realized; for the most expensive part of the work of preparing or constructing the mine is now done.

ON BRASS FOUNDING.

Brass Founding is beset with a host of empirical rules and fancies, to an extent which naturally surprises the scientific practician, when he considers it with regard to the present calculating and philosophizing age. Every founder thinks he possesses the only true and orthodox system of producing first-rate castings, and, as a matter of course, every one differs from his neighbor in his routine of practice, without reflecting that the process admits as fully of a reduction to scientific rules as any of its sister branches of the manipulatory art.

It is scarcely necessary to observe, that excellence can never be attained in any art in the prosecution of which so loose a system is tolerated: *guess-work* will ever give chance results, productive only of inconveniences and objections, which a more systematic code of regulations would entirely obviate. The number of alloys of copper which come under the generic name of brass, amount to a numerous family, and are of the greatest importance, not only to the engineer, but to artists generally, involving the use of the following different metals, all of which are required in a greater or less degree to suit the variety of operations where brass is indispensable; namely, copper, tin, lead, zinc, antimony, and, in some cases, nickel.

The first four of these metals are those in the greatest request for engineering purposes. The leading metal of this series, copper, was known to the ancients previous to the discovery of *malleable iron*, and was applied to all the purposes for which the latter metal alone is now used.

The word copper is derived from the Island of Cyprus, where it was first wrought by the Greeks. The best method of obtaining it pure, where extreme purity is an object of importance, is to dissolve it in nitric acid; the solution is then diluted, and a piece of iron introduced, upon which the pure metal is precipitated, any adhering particles of iron being readily removed by washing with dilute sulphuric acid. Another method has lately been discovered of purifying copper, namely, by melting 100 parts of it with 10 parts of copper scales (black oxide), along with 10 parts of ground bottle-glass, or other flux. Mr. Lewis Thompson, who received a gold medal from the Society of Arts, for this invention, says that after the copper has been kept in fusion for half an hour, it will be found at the bottom of the crucible, perfectly pure, while the iron, lead, arsenic, &c., &c., with which this metal is usually contaminated, will be oxidized by the scales, and will dissolve in the flux, or be volatilized. Thus he has obtained perfectly pure copper from brass, bell-metal, gun-metal, and several other alloys, containing from 4 up to 50 per cent. of iron, lead, bismuth, antimony, arsenic, &c. The scales of copper are cheap, being the product of every large manufactory. Copper melts at a white heat, and by slow cooling may be crystallized. Its specific gravity is 9, nearly. It melts at a temperature of 1996° Fahr.

The reduction of copper ore is made by several consecutive processes. The first is by calcining it, and, when the ore is sufficiently "roasted" to oxidate the iron which it contains, it is melted. The melted metal is, after a time, suffered to flow into a pit filled with water, by which it becomes granulated.

It then undergoes further heating, and what is called technically its slag (or scoria) is taken off, and it is allowed again to run off into water.

After these processes it is cast in sand, when it becomes solid, and in this state is called "blistered copper."

It is now fit for what is called the refinery, and undergoes an operation called *refining* or *toughening*. This is considered to be an operation of delicacy, and requires great skill and care in the workmen. It is conducted to a furnace similar to the melting furnace, and the object is to thoroughly purify the metal from any portions of oxygen, which is performed by adding charcoal to the copper, while it is in fusion, and stirring it occasionally, till it is judged to be pure.

TIN, OR BEDIL IN THE HEBREW.—The next metal on our list has also been known from the remotest ages. It is mentioned by Eleazar the priest in the book of Numbers, chap. 31st, verse 22d. All the other metals supposed to have been then known are enumerated in the same passage. Thus, lexicographers form *bedil*, "to separate," tin being a separating metal. This carries the knowledge and use of *tin* back 1500 years antecedent to the commencement of our era. The Phœnicians used tin, of course, in the erection and decoration of the temple of Solomon. Their brass was bronze; zinc had not then been discovered. We read of tin, also, having been got by the Carthaginian navigator, Himiles, from the Sicily Islands; they certainly present appearances of ancient excavations. Tin occurs native in two forms—as peroxide, and as sulphuret of tin and copper. The last is rare; the former constitutes the great source of tin, and, in its native mixed state with arsenic, copper, zinc, and tungsten, is called "tin-stone;" but, when occurring in rounded masses, grains, or sand in alluvial soil, is called stream tin. The metal reduced from the tin-stone forms *block tin*—that from the stream tin forms *grain tin*.

The greater part of the East Indian tin comes from Siam, Malacca, and Banca. The last place is an island near the southeast coast of Sumatra. The mines were discovered in 1711; in 1776 there were ten pits, which were worked by the Chinese on account of the King of Palimbang. One hundred and twenty-five pounds cost him only five rix dollars. The greater part went to Alinia, or was used in India.

ZINC.—Zinc is a metal whose extensive range of application is only now beginning to be understood. It is found in the state of oxide and sulphuret; its specific gravity is about 7·7; its fusing point is 773°, but at a temperature of 300°, it becomes extremely malleable, and may be rolled into thin leaves, or drawn into fine wire. One of its most valuable modern applications, is as a protective covering for iron, being the best known substance for this purpose. The purifying of zinc may be effected by melting the impure metal with *lead*, in equal parts, in a deep iron pot, stirring them well together, skimming off the impurities as they rise, covering the surface with charcoal to prevent oxidation, and keeping them in a fused state for three hours. The lead descends to the bottom by its greater density, and leaves the zinc above, to be drawn off by a pipe in the side of the melting-pot. This contrivance is the subject of a patent, granted to Mr. William Godfrey Kneller, in 1844.

Brass moulding is carried on by means of earthen, or sand moulds. The formation of sand moulds is by no means so simple an affair as it would at first sight appear to be, as it requires long practical experience to overcome the disadvantages attendant upon the material used. The moulds must be sufficiently strong to withstand the action of the fluid metal perfectly, and, at the same time, must be so far pervious to the air as to permit of the egress of the gases formed by the action of the metal on the sand. If the material were perfectly air-tight, then damage would ensue from the pressure arising from the rapidity of the generation of the gases, which would spoil the effect of the casting, and probably do serious injury to the operator.

If the gases are locked up within the mould, the general result is what moulders term a *blown* casting; that is, its surface becomes filled with bubbles of air, rendering its texture porous and weak, besides injuring its appearance.

Plaster of Paris is often used for a number of the more fusible metals. This material, however, will not answer for the more refractory ones, as the heat causes it to crumble away and lose its shape.

Sand, mixed with clay or loam, possesses advantages not to be found in gypsum, and is consequently used in place of it, for brass and other alloys. In the formation of brass moulds, old damp sand is principally used in preference to the fresh material, being much less adhesive, and allowing the patterns to leave the moulds easier and cleaner.

Meal dust or flour is used for facing the moulds of small articles, but for

larger works, powdered chalk, wood-ashes, &c., are used, as being more economical.

If particularly fine work is required, a *facing* of *charcoal* or *rottenstone* is applied. Another plan for giving a fine surface is to dry the moulds over a slow fire of *cork shavings*, or other carbonaceous substance, which deposits a fine thin coating of carbon. *This*, when good fine facing sand is not to be obtained.

As regards the proportions of sand and loam used in the formation of the moulds, it is to be remarked, that the greater the quantity of the former material, the more easily will the gases escape, and the less likelihood is there of a failure of the casting; on the other hand, if the latter substance predominates, the impression of the pattern will be better, but a far greater liability of injury to the casting will be incurred from the impermeable nature of the moulding material. This, however, may be got over without the slightest risk, by well drying the mould prior to casting, as you would have to do were the mould entirely of loam.

The experienced find that the proper time for pouring the metal is indicated by the wasting of the zinc, which gives off a lambent flame from the surface of the melted metal. The moment this is observed, the crucible is to be removed from the fire, in order to avoid incurring a great waste of this volatile substance. The metal is then to be immediately poured. The best temperature for pouring is that at which it will take the sharpest impression, and yet cool quickly. If the metal is very hot, and remains long in contact with the mould, what is called *sand-burning* takes place, and the face of the casting is injured.

The founder, then, must rely on his own judgment, as to what is the lowest heat at which good sharp impressions will be produced. As a rule, the smallest and thinnest castings must be cast the first in a pouring, as the metal cools quickest in such cases, while the reverse holds good with regard to large ones.

Complex objects, when inflammable, are occasionally moulded in brass, and some other of the fusible metals, by an extremely ingenious process; rendering what otherwise would be a difficult problem a comparatively easy matter.

The mould, which it must be understood is to be composed of some inflammable material, is to be placed in the sand-flask, and the moulding-sand filled in gradually, until the box is filled up. When dry, the whole is placed in an oven sufficiently hot to reduce the mould to ashes, which are easily removed from their hollow, when the metal may be poured in. In this way (as will be afterwards shown) small animals, birds, or vegetables may be cast with the greatest facility.

The animal is to be placed in the empty moulding-box, being held in the exact position required, by suitable wires or strings, which may be burnt or removed, previous to pouring in the metal.

Another mode which appears to be founded on the same principle, answers perfectly well when the original model is moulded in wax. The model is placed in the moulding-box in the manner detailed in the last process, having an additional piece of wax to represent the runner for the metal. The composition here used for moulding is similar to that employed by statue-founders in forming the cores for *statues*, *busts*, &c., namely, two parts brick-dust to one of plaster of Paris. This is mixed with water, and poured in so as to surround the model well. The whole is then slowly dried, and when the mould is sufficiently hardened to withstand the effects of the molten wax, it is warmed, in order to liquefy and pour it out. When clear of the wax, the mould is dried and buried in sand, in order to sustain it against the action of the fluid metal. —*Brass and Iron Founder's Guide*, by Jas. Larkin, 1853.

JOURNAL OF SILVER AND LEAD MINING OPERATIONS.

PRODUCTION AND PRICE OF LEAD AT GALENA.

A tabular statement of the amount of lead produced at the Upper Mines since 1841, with the average prices for each year, has been prepared by Captain Edward H. Beebe, of Galena. It presents the following results:

Year.	No. Pigs.	Price.	Year.	No. Pigs.	Price.
1841	452,814	not known.	1847	772,656	$3 17
1842	447,909	$2 24	1848	681,969	3 24
1843	559,261	2 34	1849	628,934	3 67
1844	627,672	2 80	1850	568,589	4 20
1845	778,498	2 96	1851	474,115	4 08
1846	782,408	2 89	1852	408,628	4 12

It will be seen that the total production of lead in the past twelve years, has been 7,140,248 pigs; or *four hundred and forty-nine millions, eight hundred and seventeen thousand, three hundred and sixty pounds!* at an average price of three dollars twenty-four cents and sixty-three one-hundredths per lb., or a total of $14,602,410.

Upon this statement the *Jeffersonian* thus remarks:

Of this lead, nine-tenths has been shipped from Galena.

The effect of the California emigration upon the quantity of lead produced, is seen clearly in the table above. In 1848, when the fever was raging most violently, the falling off is most visible. The decrease has been rapid until the present year, though the lead, actually dug, has all the while had the benefit of a rising market. The flood of emigration is turning this way again; and we hope, at the close of navigation, to be able to say that the product of this year exceeds that of 1852, by 50,000 to 100,000 pigs. Enough is now known to warrant us in asserting that the increase will be considerable, though the precise figures cannot be set down.

PROSPECTS FOR MINING ENTERPRISE IN MEXICO.

The well known richness of the Mexican mines has attracted to them, of late, more than ordinary attention, especially to those in the region of country bordering upon the Rio Grande. In the preceding pages of the present number of this Magazine will be found some interesting facts relative to the mine of "Jesus Maria," in the State of New Leon. The facilities for mining enterprise in the region of the Rio Grande, however, form a subject of preliminary importance, and we are happy to lay before our readers the subjoined statements on this important point, from a very respectable authority.

It must be asked how far the general condition of the country may be favorable or unfavorable to mining enterprise. To answer this question, we shall first try to give a sketch of the natural character of this part of the North American continent.

Generally speaking, the State of Chihuahua is formed of extensive plains, elevated from five to seven thousand feet above the level of the sea, divided by steep, rocky, porphyritic mountains in detached ridges and irregular groups, and by a few valleys cut into the deep alluvial soil of the plains. Along the western confines of the State, bordering on Sonora and Sinaloa, runs the chain of the Sierra Madre, which by no means forms the water shed between the tributaries of the Atlantic and Pacific, but is a broad belt of mountain ridges decidedly *on the western slope of the continent.* The head waters of the Rio

Yaqui, and of some other rivers, flowing, in a westerly direction, into the California Gulf, are on the high savannas bordering that belt of mountains *to the east.* These savannas are that part of the country where its plains reach their highest elevation. The little lake of Cerro Prieto, situated in these savannas, cannot be much below eight thousand feet above the ocean. Of the mountains, none appear to exceed nine thousand feet, their elevation above the general level of the country never being very considerable. To this the Sierra Madre forms no exception. None of its mountains—in the confines of the State of Chihuahua at least—appear to rise above the height which permits the growth of trees.

With a few exceptions, the Sierra Madre alone is covered with high timber, consisting of several kinds of pine. In the other portions of the country fine timber, or even timber at all, is exceedingly scarce.

Stunted oak and the roots and branches of mezquit bushes are the fuel generally used. A few cotton-wood trees planted around the towns, and along the course of some little rivers and brooks, are the only trees of any size to be seen in distances of many hundred miles. Yet the country is well covered with vegetation. Plains and mountains are overgrown with grass and shrubbery, and some of the savannas, watered by fine lake and surrounded by steep, but green ridges, are the finest pastures which can be seen, having not exactly an alpine character, but a beauty of natural scenery not less perfect and grand. There is, however, a remarkable difference of character in the vegetation of the eastern and western portions of the country. In the first, the grass of plains and mountains is generally intermixed with thorny shrubs of different kinds belonging to the acacia or mimosa family, and several species of cactus and yucca, the whole forming what is called a *chaparral*, which, however, with the exception of the valley of the Rio Grande and its neighborhood, is scarcely ever very dense, and never so much so as in some more southern portions of Eastern Mexico, where it is almost impenetrable. West and southwest of Chihuahua the chaparral disappears. On the high plains in the neighborhood of the Sierra Madre the grass of the savannas is as pure as that of the finest cultivated meadows, while several kinds of evergreen oak, growing to the size and form of a vigorous old apple-tree, are scattered over the green turf of the mountain sides and gorges and hill and dale, standing in little groves, in patches, or like the trees of an orchard, imparting to the whole country an appearance of a particularly cheerful beauty. On the first ridges which skirt the belt of the Sierra Madre the oak appears mixed with pine, till at last, in the interior of that chain, the former disappears before the exclusive dominion of the latter.

Such is the general character of vegetation in this part of Mexico. Its climate, which is healthy in an uncommon degree, and, in some respects, really delightful, is chiefly characterized by extreme dryness, at least in the eastern portion of the country, where the greater part of the crops are raised by irrigation. Here during the whole winter, and till the month of June, clouds are seldom seen, snow does not fall every year, and when it falls remains only a few days. Rains, before the month of June, are rare exceptions, and, though trees and shrubs begin to thrive in March and April, yet the grass does not become green before June, when the summer rains begin, giving full new life to the whole vegetation for the rest of the year. During the summer the days are hot, but the nights are always refreshing. The winter is cool enough to have a bracing influence on the constitution; but even on the high plains near the Sierre Madre, in an elevation more than 7000 feet above the sea, it is as mild as in Southern Germany or Switzerland. Apples and peaches grow perfectly well here, and the crops of Indian corn reach the highest perfection. The average price of this commodity is about the same in this country as in the United States, but is exposed to greater fluctuations according to time and situation, freight being high, and some parts of the country being occasionally

exposed to distressing dryness. The cold of the winter, however, is more severely felt here than in much colder but more civilized countries; glass windows, with the exception of a few houses in the capital, being almost unknown. To this want of a good shelter, and the still more severe want of suitable clothes, to which nearly the whole population is exposed, the many catarrhal diseases which occur at certain seasons, and sometimes assume a serious character, are to be ascribed.

Contrary to what is the case in many other countries, the mines of the State of Chihuahua are situated in localities favored by nature. Those of the Sierra Madre are well provided with water, timber and fuel, and crops as fine as any where else can be raised close by, while the "tierra caliente," or hot country of the States of Sonora and Sinaloa, is at a distance so short that all kinds of tropical and half tropical productions can be had cheap enough. In respect to water and wood, the mines of Santa Eulalia alone form an unfavorable exception.

Less favorable is the report which can be made in respect to the facilities afforded by the industrial state of the country. Good mechanics are hardly to be found among the natives. They work badly, slowly, awkwardly in the highest degree, and yet are very dear. Foreigners going into mining enterprises here, would have to provide for that want by bringing mechanics, tools, and machines along with them. The same would not be the case with the miners, the natives having sufficient experience in that branch to be useful, and what foreign miners would do better would be counter-balanced in most cases by certain disadvantages naturally connected with their introduction. In general the Mexican is capable of hard work, if he finds a sufficient impulse to do it, and if well directed; but an exterior impulse he must have, and directed he must be. Neither his energy nor his skill is primitive.

The old Spanish laws, which have been preserved, are very favorable to enterprise, facilitating the acquisition of mines and promoting the credit required for that part of the national industry in an uncommon degree. The facilities granted by them have been extended to foreigners without restriction.

If the question be asked, why the Mexicans themselves are so slow and unsuccessful in a branch of industry in which, though not on the level of advanced science and art, yet they are not inexpert, and which has the advantage of not being at the mercy of the Indians who have ruined the cattle farms of the nation, once the second source of its wealth,—why, becoming poorer every day, they do not avail themselves of the immense treasures existing in their mountains to better their situation,—the only answer is that the fault is in their moral character. There are, no doubt, some enterprising men among them, but the nation at large have not—nay, do not even understand—that spirit of of restless activity which acts because action is life, and risks because risking is a pleasure. Avidity is not enough to make a nation successful, and even the gambler must have some passion less mean to be so. If the true spirit of enterprise were existing in this nation, there would be capital enough left in the country to give to mining industry a new start capable of success. But, as the author of the memoir from which we take the special facts communicated above, himself confesses, "Mexicans do not know the word Association." For that their practical views are not large enough. And how far they are from finding the right way out of the condition in which they are, may be seen from the manner in which they apologize for it. "If we had a denser population our condition would be more prosperous," some will say, without asking how it comes that the population of this country does not increase like that of California, since the latter forms a part of the North American federation. "If we had a better Government, every thing would be different," others will say, without investigating how it comes that their Government is bad, constituted as it is by themselves. Thus always excusing themselves by finding fault in

something which they believe to be a foreign agency, but is really a part of their own minds, they lose even the talent of learning by comparison. "California was nothing while it was a Mexican territory; why is it rich and great since it was annexed to the United States?" asks the author of our memoir. "Because the Mexican Government did not promote and protect industrial enterprise, and the North American Government does so"—is the answer he gives. If you try to show a Mexican that it is just the contrary,—that it is just the misfortune of the Mexicans to look for the interference of their Government where they should act themselves, and to have a Government which interferes in every thing,—and that it is the good fortune, or rather good sense, of the North Americans to have one which does not meddle at all with the private concerns of its citizens,—he will not understand you.

It is neither the fault of the mines, then, nor of the natural condition of the country, if the former also do not prosper as they formerly did.

JULIUS FROEBEL.

RICHNESS OF MEXICAN SILVER MINES.

The mine of *Santa Eulalia*, near Chihuahua, was worked as early as 1705. Its registered produce from that time till 1737, was $55,959,750 or $1,784,742 per annum; and up to 1791, it yielded more than forty-four millions—making one hundred millions in eighty-six years.

The mine of *San Dimas*, in Durango, yielded, from 1783 to 1807, fifty-five millions, to Zambrano and associates. The metalliferous dust of the famous mine of *Zavalo*, gave from six to seven millions in three years. This was at Real Catorce, whose ores resemble, in a remarkable degree, those of *Jesus Maria!* One of the owners of the mine of Santa Ana, left to charitable purposes four millions at his death, and large estates besides. The riches of Del Monte can hardly be said to have diminished in the term of one hundred years, although the difficulty of draining has caused several long suspensions. The same may be said of *Bolanos*. The family of Bustamente, from the poduce of a northern mine, purchased their title for $300,000, made a present to the king of a ship of the line, and loaned him a million of dollars. In Sombrerete, Durango, the mine of Pavellon yielded at one period, according to a contemporary author, twenty thousand dollars a day for five years! The water then rose, overcame their rude machinery, and the mine lay abandoned for eighty years. It was again restored by the *Fagoago* company, and yielded immense treasures. In Zacatecas, Guanajuato, Real Catorce, &c., &c., the mines restored by foreign capital, since the revolution, have had seasons of good and bad, and their Bonanzas, or remarkable yields. One of them gave $365,000 to the *vara* (24th part of a mine) in a single year.

SILVER MINES IN PEQUEA VALLEY, PENNSYLVANIA.

Another of those mines which were worked previous to our Revolutionary War has attracted recently considerable attention. It is a silver mine in the neighborhood of Lancaster, Pennsylvania. It has been taken up by capitalists, who are prosecuting their operations with considerable vigor. This is not the first instance of the kind. A copper mine in Bart township, originally opened and abandoned under similar circumstances, has been in successful operation for about two years. A lead mine, discovered and partially opened in East Hempfield several years since, is about to be tested again. Several mines in the Eastern States abandoned under like circumstances have been entered upon by capitalists with quite flattering prospects.

The particulars respecting these mines in Pequea Valley, are described with

much intelligence, by the Editor of a neighboring Journal who visited them. —*Lancaster Whig.*

This mine is designated on the map of Lancaster county as a "Silver Mine," (in immediate proximity to what is also designated on the map as "Silver Mine Run"); and such indeed it is. The whole surrounding district appears to have been the scene of former extensive mining operations. The principal mineral found at this mine, is argentiferous galena, a recent assay of which, by Dr. Fahnestock, shows it to contain upwards of five hundred dollars ($500) worth of silver to the ton of lead—thus making the metal worth, at present market rates, considerably over six hundred ($600) per ton. Similar assays by Professor Booth of the U. S. Mint, at Philadelphia (who, we are informed, made lately a cursory geological examination of the mines), as well as by numerous other chemists, show a result very nearly similar. The ore, we may add, also yields about 80 per cent. of lead.

The characteristic geological formation of this interesting valley, we presume is that denominated the Metamorphic—the prevailing rocks being limestone of various qualities alternating with clay slate, and in turn running into gneiss. The range of hills, however, which basin the valley on the south and generally known as Mine Ridge, is, we believe, a granite formation, and the whole affords evidence both of sedimentary and igneous action. The limestone is traversed throughout the entire length of the valley, by numerous veins of quartz rock, which, as they come to the surface, appear to radiate in all directions. The quartz veins appear to have assembled on, and to diverge from, the brow of a high hill in a direction northeast by southwest, *in direct contrariety to the regular stratification.* An anti-clinal axis is here formed, and the veins dip in opposite directions, being covered *unconformably* by clay slate.

The mineral is carried in these quartz veins, but occasionally dips into the adjacent limestone—which, running off with occasional small seams, has thus abstracted, and scattered around, minute particles of the mineral. In the tunnels which have been excavated, the beautiful ore is seen glittering from numerous spots above and around, thus indicating the extraordinary abundance of the mineral, when traced to its proper veins or original position below. In addition to the silver and lead, of which there are probably upwards of two tons lying on the ground, we noticed some specimens of good copper and zinc ore, as well as some gossan, which Mr. B. informs us contains a considerable amount of silver, though the exact quantity has not yet been ascertained. This gossan appears to be the result of the decomposition of the quartz and limestone, and is another strong proof of the mineral character of the formation.

With regard to the former history of this remarkable mine, little or nothing of a positive character is known. It is certain that the mine was prosecuted by British capitalists, who resided in England; that all their machinery, tools and implements were brought from that country; and that the mines were worked for a considerable number of years, up to the time the Revolutionary War broke out.

Mr. Bowen has thus far been engaged for the most part in cleaning out the old shafts and tunnels. One tunnel, or adit level, which we entered, is about one hundred yards in length, seven feet high, and five feet wide, driven through solid rock. A shaft along the Pequea Creek, is about fifty feet deep, and an adit level had just been commenced, which was probably intended to supersede the former, about one hundred feet below. The main shaft, however, which is supposed to be from two to three hundred feet deep, has not yet been cleared out.

It is supposed (and the supposition is certainly well supported by the size of the dirt heap outside) that another tunnel runs under that alluded to, from the main shaft. However this may be, the vein appears to have been pretty well worked out as it emerged towards the surface, and there can be no question as to the success which attended their operations from the systematic manner in which they were prosecuted. Numerous "trial pits" of more or less depth are spread over the surface to the distance of nearly half a mile, as if the vein

had been carefully and diligently proved on the surface, before definite arrangements for permanent mining had been made. Mr. Bowen has already found some six or seven implements, all of different and peculiar structure, and such as *regular miners* alone could use. From the very midst of these shafts, and towering from the dirt heaps themselves, are trees of considerable age, two of which we judge, are seventy years old. The spot was covered with trees some fifteen years ago.

SILVER ON LAKE SUPERIOR.

We learn from George Johnston, of this place, that a recent discovery has been made of a native silver vein somewhere upon the shores of Lake Superior, which may prove one of great wealth. He has a specimen in his possession from the above *undefined* locality, which can be seen on his return from La Anse.—*Lake Superior Journal.*

SILVER ORE IMPORTED INTO ENGLAND.

A considerable quantity of silver is now obtained from lead, the expenses of its extraction having been materially diminished by the invention of improved processes. Of the lead raised in Great Britain, it is stated that about one half yields 8 ounces of silver per ton, being in value £25,000 per annum. We receive imports of silver ore from the west coast of South America into Swansea and Liverpool, and a little into London. It is always brought in small bags of about 1½ cwt., and that for Liverpool is deposited in the same premises as the copper ore landed at the Harrington Dock. The quantity of silver ore imported during the last year into Liverpool, amounted to 2900 tons—in value about £190,000. This year, up to the present time, 1800 tons have been imported, of a richer quality, and which may be estimated as worth £135,000. The price obtained entirely depends upon the quantity of fine silver contained in the ore, and varies from £10 to £650 per ton.

The ore was formerly sold to one or two silver smelters on a comparatively small scale, but is now distributed throughout the kingdom, the trade having latterly so much increased, and become so important, that many of the lead and copper smelters have been induced to turn their attention to it, and the ore is now chiefly sent hence to the Dee, Newcastle-upon-Tyne, Sheffield, Llanelly, Swansea, Devon, and Cornwall. Other furnaces are also in course of erection in this immediate neighborhood; and from the central position of Liverpool, and the facilities afforded for disposing of the ore, there is every expectation that the trade will go on here steadily increasing in value.—*London Journal.*

THE MARKET FOR WESTERN LEAD.

Under this title one of the western journals, the *Jeffersonian*, in the neighborhood of the Upper Mines, makes some suggestions of interest to those desirous of being familiar with the course of the Western Lead trade:—

Since the Upper Mines first began to be worked, ninety-nine of every hundred pigs of lead produced therein, have found a market at St. Louis, or at least have been shipped to that point, and from thence, on account of owners, to New Orleans and New-York. Present indications point to a change in the accustomed channels of this important trade. The rapid settlement of the States of Indiana, Illinois, Michigan, Wisconsin, Iowa, and the territory of Minnesota, has produced a demand for articles manufactured from our great staple, which the "lead crop" will, in a few years, fail to supply. Heretofore, about half the amount annually produced has gone to the Atlantic seaboard, 125,000 pigs have been manufactured in St. Louis, 150,000 have gone up the Ohio, and 20,000 to Chicago and the lake ports. With the present rapid increase of population in the States afore-named, the whole annual product will

be within a brief time required for home consumption. The completion of the different lines of railroad running into the mining district, will cause new manufacturing establishments of white lead, lead pipe, and rolled lead and shot, to spring up in localities where, without artificial means of communication with the source from whence the raw material is supplied, they would never have been thought of. These will supply the districts of country by which they are surrounded, and so great will be the demand upon us, that without increased productions here, the shipments to the seaboards must wholly cease.

In this view of the case we submit to our citizens the question: "Shall we continue as heretofore to supply the country with pig lead only, or shall we add lead manufactures to lead mining, and derive a profit from each?"

There is no reason why all articles of which lead is the principal component part, may not be manufactured here as cheaply as in Buffalo, Cincinnati or St. Louis. Labor is as cheap, food is as cheap, and rents are as cheap here as in either of the above-named cities. Here the raw material is abundant; capital and the requisite enterprise can change its shape into consumable commodities, and the whole country can be made your customers. We commend the matter to the consideration of those who are not willing to believe that because this thing has never been done heretofore, it cannot be done hereafter.

EXTENSIVE LEAD DEPOSIT.

During a passage down the Mississippi from McGregor to Galena, a few days since, Captain Smith Harris, of the West Newton, pointed out to us the locality of a vein of lead ore along the bank of the river, a mile and a half in length. This vein occurs in the lower magnesian lime rock, on the west bank of the Mississippi, between Clayton City and the old French Village, about sixteen miles below Prairie du Chien. At that point, this rock, which is here supposed to be 300 or 400 feet beneath the surface, is cut through by the river, leaving the upper part of the stratum above high-water mark.

We have characterized this deposit as a "vein;" it is not so, but rather a succession of pockets in a horizontal line, close together, but separate from each other, all of which contain more or less mineral. An attempt was once made to run a level into the bluff from the river; but, though the mineral obtained covered the cost of the labor in the few feet "driving" which was accomplished, it was abandoned before the existence of any large deposit was proved—for what reason we are not informed.—*Jeffersonian.*

LEAD MINE IN IOWA.

In Clayton county, Iowa, a lead mine was lately discovered by Messrs. Holmes and Dickson, who have taken out 120,000 lbs. of mineral within the last four weeks, and have another 100,000 in sight. It is said to be found on the surface of the upper strata of magnesian limestone, and about eighty feet below the surface of the earth, at the highest point of the ridge running east and west, and directly across the ridge. It has now become the settled conviction, at least with a great many, that the whole country formerly reserved by the Government for mineral purposes, will prove to be rich in lead ore, and of the best quality.—*Cincinnati Enquirer.*

PRODUCE OF LEAD IN GREAT BRITAIN.

The amount of lead produced in previous years in Great Britain, the character of the mineral region, and the experience of English miners, are topics of considerable interest, as contrasted with similar facts in relation to our own country. These are stated with much explicitness in the subjoined remarks:

Of all the countries in the world, Great Britain is that which annually pro-

duces the greatest quantity of lead. According to M. Villefosse, in his *Richesse Minerale*, published in 1819, we had furnished every year 12,500 tons of lead, whilst all the rest of Europe taken together did not produce so much; but from more recent documents, that estimate seems to have been too low. Mr. Taylor (in 1822) rated the total product of the United Kingdom *per annum*, at 31,900 tons, a quantity fully 2½ times greater than the estimate of Villefosse. (See Conybeare and Phillips' Geology, p. 354). Mr. Taylor distributed this product among the different districts as follows:—

	TONS.
Wales, (Flintshire and Denbighshire)	7,500
Scotland, (in transition graywacke)	2,800
Durham, Cumberland, and Yorkshire, (in carboniferous lime)	19,000
Derbyshire, (probably in carboniferous lime)	1,000
Shropshire	800
Devon and Cornwall, (transition and primitive rocks)	800
Total	31,900

We thus see that Cumberland and the adjacent parts of the counties of Durham and York, furnish of themselves nearly three fifths of the total product. Derbyshire was formerly much more productive. In Cornwall and Devonshire the lead ore is found in veins in *killas*, a clay slate passing into graywacke. In North Wales and the adjacent counties, as well as in Cumberland and Derbyshire, the lead occurs in the carboniferous limestone.

In 1835, the total poduced was estimated by Mr. Taylor at 46,112 tons; of which 19,626 were furnished by Northumberland, Durham, and Cumberland; the mines of Mr. Beaumont alone yielding 10,000. In 1847 the total produce was as follows:—

	LEAD ORE. Tons.	LEAD. Tons.
England	59,614½	39,507½
Wales	18,147½	12,294
Ireland	2,251	1,380
Scotland	1,159	822½
Isle of Man	2,575	1,699
Total	83,747	55,703

The English lead miners distinguish three different kinds of deposits of lead ore; *rake-veins*, *pipe-veins*, and *flat-veins*. The English word vein corresponds to the French term *filon;* but miners make use of it indifferently in England and France, to indicate all the deposits of this ore, adding an epithet to distinguish the different forms; thus, *rake-veins* are true veins in the geological acceptation of the word vein; *pipe-veins* are masses usually very narrow, and of oblong shape, most frequently parallel to the plane of the rocky strata; and *flat-veins* are small beds of ores interposed in the middle of these strata.

Rake-veins are the most common form in which lead ore occurs in Cumberland. They are in general narrower in the sandstone which covers the limestone, than in the calcareous beds. A thickness of less than a foot in the former becomes suddenly 3 or 4 feet in the latter; in the rich vein of Hudgill-burn, the thickness is 17 feet in the *great limestone*, while it does not exceed 3 feet in the overlying *watersill* or sandstone. This influence exercised on the veins by the nature of the inclosing rock, is instructive; it determines at the same time almost uniformly their richness in lead ore, an observation similar to what has been made in other countries, especially in the veins of Kongsburg, in Norway. The Cumberland veins are constantly richer, the more powerful they are, in the portions which traverse the calcareous rocks, than in the beds of sandstone, and more particularly the schistose rocks. It is rare in the rock called *plate* (a solid slaty clay) for the vein to include any ore; it is commonly filled with a species of potter's earth. The upper calcareous beds are also in general more productive than the lower ones. In most of these mines, the

veins were not worked till lately below the fifth calcareous bed (the four fathom limestone), which is 307 yards beneath the millstone grit; and as the first limestone stratum is 108 yards beneath it, it follows that the thickness of that part of the ground where the veins are rich in lead does not in general exceed 200 yards. It appears, however, that veins have been mined in the neighborhood of Alston Moor, downward to the eleventh calcareous stratum, or Tyne bottom limestone, which is 418 yards under the millstone grit of the coal formation, immediately above the whinsill; and that they have been followed above the first limestone stratum as high as the grindstone sill, which is only 83 yards below the same strata of millstone grit; so that in the total thickness of the plumbiferous formation there is more than 336 yards. It has been asserted that lead veins have been traced even further down into the *Memerby* scar limestone; but they have not been mined.

The greatest enrichment of a vein takes place commonly in the points where its two sides, being not far asunder, belong to the same rock; and its impoverishment occurs when one side is calcareous and the other a schistose clay. The minerals which most frequently accompany the galena, are carbonate of lime, sulphate of baryta, quartz, and pyrites.

The pipe-veins (*amas* in French), are seldom of great length; but some have a considerable width, their composition being somewhat similar to that of the *rake-veins*. They meet commonly in the neighborhood of the two systems, sometimes being in evident communication together. They are occasionally barren; but when a wide pipe-vein is metalliferous, it is said to be very productive.

The *flat-veins* or *strata-veins*, seem to be nothing else than expansions of the matter of the vein between the planes of the strata, and contain the same ores as the veins in their vicinity. When they are metalliferous, they are worked along with the adjacent rake-vein, and are productive to only a certain distance from that vein, unless they get enriched by crossing a rake-vein. Some examples have been adduced of advantageous workings in *flat veins* in the *great limestone* of Cumberland, particularly in the mines of Coalcleugh and Nenthead. The *rake-veins*, however, furnish the greater part of the lead which Cumberland and the adjacent counties send every year into the market. Mr. Foster has given a list of 165 lead mines which have been formerly, or are now worked in that district of the kingdom.

The metalliferous limestone occupies, in Derbyshire, a length of about 25 miles from northwest to southeast, under a very variable breadth, which towards the south amounts to 25 miles. Castleton to the north, Buxton to the northwest, and Matlock to the southeast, lie nearly upon its limits. It is surrounded on almost all sides by the millstone grit which covers it, and which is, in its turn, covered by the coal strata. The nature of the rocks beneath the limestone is not known. In Cumberland the metalliferous limestone includes a bed of trap, designated under the name of *whinsill*. In Derbyshire the trap is much more abundant, and it is thrice interposed between the limestone. These two rocks constitute of themselves the whole mineral mass, through a thickness of about 550 yards, measuring from the millstone grit; only in the upper portion, that is near the millstone grit, there is a pretty considerable thickness of argillo-calcareous schist.

Four great bodies or beds of limestone are distinguishable, which alternate with three masses of trap, called toadstone. The lead veins exist in the calcareous strata, but disappear at the limits of the toadstone. It has now been ascertained, however, that they recur in the limestone underneath.

COALS AND COLLIERIES.

THE ANTHRACITE COAL TRADE FOR 1853.

	TONS.
Amount shipped from Richmond to close of week ending Nov. 12	1,039,496
Same time last year	1,179,037
Decrease	139,541
Amount sent by Railroad to close of week ending Nov. 17 .	1,516,121 08
Do. Schuylkill Canal	801,864 02
	2,317,985 10
Same time last year	2,326,107 17
Decrease	8,122 07
Amount of Lehigh Coal shipped to close of week ending . .	958,843 16
Last year	1,048,007 11
Decrease this year	89,163 15

This region is only 8,122 tons short of the supply to same period last year. This can be made up by the first of December. The men work more regularly than they did some time ago—and the same Colliery forces mine about 5000 tons of coal more per week than they did some time ago.—*Pottsville Journal, Nov. 19th.*

CUMBERLAND COAL TRADE FOR 1853.

	TONS.
Shipments over Mt. Savage Iron Company's Railroad, for the year beginning January 1st, to November 12th . .	210,584
Do. over Cumberland Coal and Iron Co.'s Railroad, from January to November 12th	201,402
Do. from George's Creek and Westernport Regions since June 1st	54,389
Total	466,375

Statement of Coal transported over the Baltimore and Ohio Railroad from the George's Creek and Westernport Regions, for the week ending Saturday, November 12th, 1853.

	TONS.
Swanton Co. and Iron Co.	639 19
Parker Vein Coal Co., viz:	
Caledonia Mines, }	328 02
Jackson do. }	824 10
George's Creek Coal and Iron Co.	1050 06
New Creek Co.	347 11
Llangollen Co.	132 18
Total	3,323 06

THE CUMBERLAND COAL BASIN.

We have heard it said of late that recent discoveries in the vicinity of Frostburg upset all the notions heretofore entertained by geologists in relation to the formation of the Cumberland Coal Basin, and extend its area far into Savage Mountain, and to the borders of Castleman's River. These discoveries are reported to have been made while sinking a shaft on the property of the Borden Mining Co., by which it was proved that the coal has a considerable covering in a direction where it was heretofore supposed to have cropped out and disappeared. We sincerely hope that these discoveries will prove to be

true, and that the existence of a rich coal field, thus far unknown, will thereby be established. This is an age of progress, and there is no reason that geologists, upon whom we have so much relied, should not turn out to be in error as well as other people.—*Cumberland Journal.*

LARGE LUMP OF COAL.

The citizens of Wilkesbarre, have recently forwarded for the Crystal Palace, four columns of anthracite coal from four over-laying seams in the Wyoming Valley, within an area of five miles of their borough. These columns are of the following dimensions:

1. A single block 3 feet in height by 2¾ square, from the upper or three foot stratum, and designed, as are all of the different columns, to show the thickness of that vein.
2. A column in two sections, measuring six feet and a half high, the thickness of the seam from which it is taken.
3. A column in three sections, nine and a half feet in height, the thickness of that seam.
4. A column in five benches or sections, measuring thirty feet in height, showing the thickness of the vein or stratum from which they are taken.
5. A specimen of coal weighing about eleven, tons taken from the thirty feet seam, showing the fracture of the coal and its pure and excellent quality.
6. Various specimens of smaller dimensions from the same 30 foot seam of coal.

THE SCHUYLKILL COAL TRADE.

Mr. *Zieber*, the agent of the *Mining Magazine* in Philadelphia, has published a Table, entitled, "The Coal Trade of Schuylkill Co., Pennsylvania." It was compiled by C. W. Peale and J. M. Wetherill, for the World's Fair at New-York, and it furnishes much valuable information. The region embraced includes the Little Schuylkill, the West Branch, the West Norwegian, the East Norwegian, Mill Creek, and Schuylkill Valley; and it comprises within its limits one hundred and eleven collieries, of which 58 are red-ash coal, and 43 white-ash coal. Seven of the red and four of the white-ash collieries were not in operation during the year 1852—being new ones. Of these collieries 62 are working coal out above water level, and 49 below water level. 48 of the red-ash collieries shipped during the year 1852, 776,675 tons, and 40 white-ash collieries shipped 1,520,744 tons, making a total of 2,297, 419 tons. This is not the whole amount of coal shipped during the year 1852, as there were collieries in operation during that year that are not now in operation; consequently this collection does not include them. There was shipped from this region, including the Little Schuylkill district, via Reading Railroad, 1,650,912 tons, and via Schuylkill Canal 800,038 tons, making a total of 2,450,950 tons. The Little Schuylkill region sent of this amount 325,099 tons. There are 122½ miles of under-ground railroads, 6¼ miles of which are through rock tunnels, and 116¼ miles in gangways through coal. There are 210 steam-engines employed directly at the various collieries; 3,805 horse-power, for hoisting coal and pumping water from slopes and shafts, the deepest of which is 353 yards, and the shortest 33 yards; 1,375 horse-power for pumping water only, and 1,891 horse-power for preparing the coal for market; making an aggregate of 7,071 horse-power. There are employed, inside and outside, at the various mines, 9,792 hands, 468 horses, and 569 mules. There are 2,756 miners, houses, exclusive of houses occupied by miners and laborers in the large towns. The amount of individual capital invested in the coal business $3,462,000. This amount does not include that invested by the land owners, which is also very large. The thickest vein worked is eighty feet, and the smallest two feet.

COAL FIELDS AND COAL MINES ON THE WESTERN WATERS.

We are indebted to Hon. H. S. Geyer for a Report of the late Secretary of the Navy, communicating, in compliance with a resolution of the Senate, the report of the commission appointed to examine the quality of the coal fields and coal mines on the western waters.

Sir:—In pursuance of the directions contained in your communication of the 9th July last, to proceed to the valley of the Mississippi and procure "full, accurate, and reliable information on the subject of the supply of coal to be obtained in the coal region of the Mississippi Valley, of its qualities and adaptation to the purpose for which it is used at navy-yards and for sea steamers, and the means and facilities for getting it to the public establishments at Pensacola and at Memphis," I have the honor to submit the following report:

That on the 1st of September last I left Baltimore, in company with Mr. William Sewell, a chief engineer of the navy, who had been detailed to accompany me. We proceeded to Pittsburgh, and thence down the Ohio and Mississippi rivers as far as Memphis, examining all the principal coal workings on those rivers. From Memphis we passed up the Mississippi as far as St. Louis making examinations in that vicinity and in the States of Missouri and Illinois. Coal is developed in the greatest quantity on the banks of the Ohio and its tributaries for nearly 900 miles bleow Pittsburgh. We found no coal workings below Caseyville, a village in Kentucky, about two miles above Trade Water Creek, a tributary of the Ohio River. At New Madrid, on what is called "Sand Blows," after an earthquake, small lumps of coal are found of various sizes.

The convulsions or earthquakes which usually visit that place follow long continued rains, and the received opinion is that the coal is ignited thereby. How much below the surface the coal is found has never been ascertained. The specimens of coal thrown up by the convulsions of nature which we saw at New Madrid, had the appearance of being subjected to the action of fire, and would seem to establish the theory of the inhabitants, that the coal is ignited by long continued rains.

In judging of the quality of the different kinds of coal, we were governed by the appearance, and the result of trials on board the steamers on the river and in workshops which came under our immediate observation, as well as the opinions of persons using it on steamboats and for manufacturing purposes.

The value and importance of the coal lands in the West have not heretofore engaged the particular attention of the owners.

The time, however, has now arrived when their value and importance are being daily developed. The scarcity, as well as the high price, of wood, on the banks of the Ohio and Mississippi rivers, will compel the owners of steamboats navigating those streams to resort to the use of coal.

The same cause will induce the large sugar establishments on the Mississippi to substitute its use for that of wood. These considerations, in connection with the increasing demand for coal at New Orleans and other points of the Mississippi, for domestic, mechanical, and steamship purposes, have induced many enterprising capitalists to embark in coal operations in the West. Companies have been and are now forming to open and work extensively the mines on the Ohio and Mississippi rivers and their tributaries; and there is no doubt that their labors will develope one of the most extensive coal regions on this continent, and at the same time, afford those who engage in the business a profitable remuneration for their outlay of capital. At present the capital employed in mining is but trifling in comparison to the importance of the object, and the working has been confined generally to the upper strata. When the mines have been further worked, and more deeply penetrated, doubtless in many instances the coal yielded will be of a superior quality to that now taken from the surface. All the coal examined by us in the West burns remarkably free. The coal in the neighborhood of Pittsburgh is generally es-

teemed the best, and bears handling and transportation without crumbling—which, by the by, is a characteristic of all western coal that came under our observation. One of the principal reasons why the Pittsburgh is esteemed the best, arises from the fact that the mines have been more extensively worked than any other in the valley of the Mississippi. There is no doubt that the coal at other points on the Ohio and Mississippi and their tributaries, when the mines are properly developed, will be equal in every respect to what is known as Pittsburgh coal. There are some mines, of which I will speak hereafter, which, according to my judgment, produce coal equal to any found as yet in the western country.

There are extensive coal fields in the neighborhood of Wheeling, in Virginia, on both sides of the Ohio River. The quality of the coal is not esteemed as highly as that of Pittsburgh, but answers for all domestic purposes, as well as some branches of manufactures. The Pittsburgh coal is generally used at Wheeling for manufacturing purposes.

An extensive manufacturer has opened a new vein, which, he informed me, produces coal superior, for many purposes, to that of Pittsburgh.

There is little or no coal shipped down the river from Wheeling.

At Pomeroy, in Ohio, coal is found in great abundance on the banks of the river, and the workings are very extensive, supplying nearly all the passing steamboats.

The mines in connection with salt-works are owned by a company, who are said to realize large profits. The coal resembles that found in the neighborhood of St. Louis and in Illinois.

On the opposite side of the river in Kentucky, several workings of coal have been commenced. Of the character of the coal we had no opportunity of judging, but, from the formations, it will doubtless be similar to that found at Pomeroy and its vicinity.

In the vicinity of Gallipolis, in Ohio, it is said coal of a superior quality is found in large quantities. In consequence of the mines being off from the river, we did not visit them. A railroad is in progress of construction from the mines to the river, by means of which the proprietors will be enabled to furnish it with great facility.

On the Elk River, in Virginia, is found the purest cannel coal I have ever known. Specimens are in the department and at the navy-yards at Norfolk and Washington. This coal has been tested by the late Professor Johnson and others, and the result of their experiments is known to the government.

The only obstacle to the introduction of this coal into general use is the difficulty encountered in getting it to market. When we were at Louisville, a boat load of coal from that region arrived which had been eighteen months on the way. I saw some of it used, and it was the most beautiful fuel I have ever seen. It commands in that market from two to three cents more per bushel than Pittsburgh or any other coal. I had no opportunity of testing its quality for steaming purposes. If it could be brought to market with facility, it would certainly supersede all others for parlor use.

Near the region of the Kanawha River, large deposits of coal are found, partaking of the character of that on the Elk River, which is a tributary of the Kanawha. The difficulty of getting it to market is a serious obstacle to its general use.

Arrangements are being made by capitalists to work these mines extensively, and it is hoped they will surmount the difficulty.

The Cannelton coal mines are on the Ohio River, in the State of Indiana. As my instructions required a particular examination of the mines in this region, I endeavored to get all the information in relation thereto in my reach. We examined several openings of these mines which have been worked at a "*royalty*," or mining privilege of one cent per bushel. The strata are about four feet thick, and formed of two distinct kinds of coal—the upper part bearing a strong resemblance to the cannel coal, and the lower portions resembling the Pittsburgh deposits. The upper portion is a light, chaffy, free-burning coal, with

little durability. When we left the mines, one hundred bushels were placed on board the steamboat, so that we might test it practically. The result was favorable to its use on sea steamers. Any quantity of the coal can be obtained with the greatest facility at the mines, at a price varying from five to six cents per bushel. The coal from the lower portion of the vein, I selected to be sent to Pensacola, not knowing that the period of delivery by contract had expired.

I would, however, recommend that the period of delivery be extended, so that a fair experiment can be made with the coal on board of a government steamer. The coal produced from these mines has been tested by the late professor Johnson, and his analysis is known to the Navy Department.

At Hawesville, Kentucky, opposite Cannelton, coal is found in great abundance, of the same description and quality as that of the Cannelton.

The mines are now being worked, and the passing steamers furnished with it. The Saline Coal Mines, in the State of Illinois, on the Saline River, two miles from the Ohio River, are most advantageously situated for the supply of passing boats, having a fine harbor.

The coal beds are said to be a portion of the great Illinois coal field. The character of the coal is said to be good; and the geological surveys represent six distinct strata, the lower one of which is seven feet thick.

The Mulford Mines, two miles above Trade Water Creek, in the State of Kentucky, are conducted on an extensive scale by the enterprising proprietors, and with great system. The passing boats can get supplied with certainty, and large quantities are sent to New Orleans and other points.

These mines have the same distinct strata as those on the Saline River. In one of the mines there is a peculiar formation: sulphur is found in large lumps, almost pure. It is separated from the coal, and wasted with the slack, near the mouth of the mine. I have deposited a specimen of it in the department.

The mines of the Hon. John Bell, on Trade Water Creek, in Kentucky, about one hundred and twenty miles above the mouth of the Ohio, are extensively worked, and yield a large profit.

The distinct strata developed at the Saline Mines are peculiar to these. The coal is of an excellent quality, and, from the tests to which we subjected it, we consider it well adapted for steaming and manufacturing purposes. There is a greater density about it than the Cannelton coal, and it makes a better hollow fire. I would respectfully suggest that some of this coal be sent to Memphis for smithing purposes.

Mount Carbon Coal Mines, Jackson county, Illinois, are situated on Big Muddy River, a tributary of the Mississippi, about seventy miles above the mouth of the Ohio. They are not now in operation. The vein of these is about five feet thick, running into a side of a hill having a thinner vein above, and I think one below, the present opening. From the opportunity we had of examing this deposit, which is extensive, it is not doubted that the coal is of a a superior quality. As Professor Johnson, B. Silliman, jr., and Mr. David Mushet, have each given a scientific analysis of it, I will not attempt to give a description of its peculiar properties.

The mines are fifty-six miles from Cairo by the central road, terminating at that point. A railroad thirteen miles in length would bring this coal to market at a navigable point on the Mississippi River, in large quantities. The proprietors have not found it convenient to make this improvement. There is a small tract near the Mount Carbon coal fields which is an out-cropping of that vein. Two of the small veins in this tract are now worked, and the passing boats and the St. Louis market supplied, when the stage of water in the Big Muddy will allow it to be floated down.

In Calloway county, in the State of Missouri, there is a most remarkable coal field, of cannel formation. The vein is reported to be of great thickness, inexhaustible, and is situated but a few miles from the river.

These coal lands are owned by a company of Eastern capitalists, who have built a railroad to the river, (Mississippi,) and will in a short time have the coal in market.

We did not visit the vein, in consequence of the low stage of water above St. Louis.

We saw specimens of it, and it is equal to the Elk River coal, which is the best that came under my observation.

The coal about St. Louis, on both sides of the river is of an inferior quality, and only used to any extent for domestic purposes.

The gas-works and principal manufactories at St. Louis use the Pittsburgh coal, or that brought from the Big Muddy.

In consequence of the low stage of water, we could not visit the coal lands in Tennessee, but, from all we could learn, the mines on the Cumberland River and at other points yield coal of the character and description generally found in the western country.

The transportation of coal on the Ohio and Mississippi rivers and their tributaries is by flat boats, containing from 10,000 to 12,000 bushels, or from 300 to 400 tons. These boats are floated in pairs to New Orleans and the intermediate points, when there is a high stage of water, which is generally in the spring and fall seasons.

Coal is usually sold at New Orleans by the barrel, the price varying from 30 cents to 75 cents per barrel, depending altogether upon the quantity in market and the demand. I had propositions to deliver coal of good quality at New Orleans at $3 68 per ton of 2,240 lbs. It can be delivered on ship-board at New Orleans for $3 68 to $4 50 per ton. At Memphis, I do not think the maximum cost would exceed $3 68 by the ton.

The cost of the transportation from New Orleans to Pensacola I had no positive means of ascertaining, but from the best information I have been able to obtain, I should think it would cost from $2 50 to $3 per ton.

So soon as the coal companies now being organized in the West are in full operation, other modes of transportation will be adopted, which will necessarily reduce the cost of coal at New Orleans.

In presenting the foregoing remarks, I regret it is out of my power to furnish you with an analysis of the coal produced at the different mines I visited. But few scientific examinations of the mines as yet have been made. The business of mining in Kentucky, Ohio, Illinois, Indiana, Missouri and Tennessee is yet in its infancy. The proprietors of the coal lands are now fast becoming aware of their great value and importance; and I have every reason to think that, with the characteristic energy of the West, in a few months a most extraordinary development will be made of the great mineral wealth of the vast region of the Mississippi Valley.

I have the honor to be your obedient servant.

J. JAMISON.

Com. Wm. B. Shubrick, Chief of the Bureau of Construction, &c.

BORING FOR COAL.

Some experiments in boring have been made in the coal region of the Schuylkill Valley which are thus described in the *Miner's Journal* at Pottsville.

The boring to the Mammoth White Ash Vein at the North American Mines has been continued during the week. The perpendicular depth at which we noticed last week coal had been struck was 384 feet. This has since proved to be the "Seven-foot" Vein, as it is known, which always overlies the Mammoth, sometimes separated by a stratum of slate, and at others immediately in conjunction with it forming one and the same vein of solid coal. It is near 8½ feet thick at the place of boring, and the intervening slate, up to the time we write, had been penetrated about 7 feet, and there was every indication of proximity to the Mammoth Vein. The slate is supposed to be 12 or 15 feet thick, at which additional depth the Mammoth Vein will undoubtedly be reached.

It may be interesting, in this connection, to notice the results likely to follow a similar experiment of proving the perpendicular depth of the Mammoth Vein in another place.

The Carey *Shaft*, near St. Clair, 2½ miles from the Navigation Landings at Port Carbon, has been sunk, under the superintendence of Mr. E. W. McGinnis of this place, to the depth of 403 feet, the deepest perpendicular shaft in the region. It measures 10½ by 18 feet. The "Seven-foot" Vein proved near 8 feet thick, and with an intervening stratum of slate, of 12 feet, between it and the Mammoth. The Mammoth Vein here is 28 feet thick!

The sinking of the shaft occupied two years, and cost $30,000; but the owners will, doubtless, be amply repaid for the investment, when once the mine is in working order. Its capacity, with the machinery now preparing for it, is estimated at 1200 tons a day! The samples of coal from this mine are of a very superior quality. Mr. McGinnis has leased these works, and, from present prospects, will soon begin to reap the rich reward he so well merits for his years of study and labor in developing the mineral wealth of the county.

The N. A. boring and the Carey shaft are about on the same range, and are about equally distant from the Port Carbon Landings. When put in working order, they will, doubtless, prove two of the most productive and valuable mines in the region.

ANTHRACITE FOR LOCOMOTIVES.

The use of coal for Locomotives is a subject which has already attracted attention. It has, however, been attempted to a very limited extent, and wood continues to be the principal fuel on all our railroads. The Philadelphia and Reading Railway has furnished one notable exception in its use. On this road Anthratic coal has been used some time. The degree of success which has attended it is well described in the annexed statement:

An impression, has prevailed among those connected with railroads, that this fuel destroys the steam fire box so quickly, that it cannot be used with economy. Other objections are understood to exist, growing out of the intensity of the heat, such as starting the bolts of the boiler, &c. But all of these objections have been removed by the Millholland engine, of which we have made mention on more than one occasion during the past two years. There are now in daily use on the Reading Railway, Pa. (running between the Schuylkill Coal Mines, and Philadelphia), twenty-eight first class locomotives on the Millholland plan; these use anthracite coal exclusively. Two of them carry passengers at the rate of thirty miles per hour, and each of the rest draws 980 tons of coal—a load—at the rate of twelve miles per hour. The average consumption of coal per engine for the trip, down and up (190 miles) is only four and a half tons, in place of nine cords of wood. The monthly consumption of coal on this road is 2,000 tons. No engineer will run a wood-burning locomotive if he can get a coal-burning one. The coal-burning engines cause far less work to engineers and firemen than wood-burning ones; they also make better time. We are not making statements relating to mere experiments, but stating facts respecting an adopted system on one of our railroads, and presenting proofs of its constant practice for three years. Every new engine built for the Reading Railroad for the last three years, burns anthracite coal, as will every new engine constructed for it. Six new locomotives on Millholland's plan, are now being built at the Company's workshops at Reading, their cost being the same as other locomotives. By a very simple contrivance the fire box is protected from injury, and by the arrangement of a gas chamber behind the bridge, most of the carbonic oxide which escapes, is caught by jets of hot air and consumed. Within two years every wood-burning engine on that road will be altered to burn coal. These facts, derived from reliable authority, will tend to convince those interested, that anthracite coal has proved to the satisfaction of this great railroad company, to be the best fuel for locomotive engines in every respect; and by far the cheapest for them.

INVESTIGATION RELATIVE TO EXPLOSIONS IN COLLIERIES.

In the last number of the Mining Magazine (Vol I, No. 5,) we gave an outline of the examination of Mr. Dickinson, Government Inspector, before the Committee of the English Parliament, relative to explosions in collieries. We now add some interesting points relative to the nature of fire-damp, &c., as presented by the *London Mining Journal:*

Mr. Dickinson then entered on another branch of the subject, and observed, in answer to a question, No. 98, "An imperfectly ventilated goaf is about the most dangerous thing you can have in a colliery—that is, where the fire-damp is mixed with fresh air enough to bring it to the explosive point. When the goaves are not at all ventilated, the fire-damp in them is generally too pure to be explosive; and I have known cases where a goaf, which has been full of fire-damp, has fired along the edge where it has been mixed with fresh air, but there not being sufficient air with the fire-damps in the goaf, it has merely been an explosion for the width of a yard or two along the edge." Mr. Dickinson stated that air may be so foul as not to be inflammable, but that when there is a strong admixture of fire-damp it is not respirable. He had in his district two men who were suffocated by inhaling a strong admixture of fire-damp. The effect is to quicken the pulse; he stated that he had tried his own pulse before going in—it was 78 at entering this admixture of fire-damp, and after being in for a few minutes it ran up to 84; he tried a manager's pulse, and it ran up from 80 to 84; he, also, tried a fireman's pulse, it was at the very unusual height of 120, and it ran up to 126. A person is only enabled to remain in this gas a few minutes, otherwise he would soon fall down and expire; and this gas was explosive at the edges. Mr. Dickinson then stated that, in order to be explosive, there must be an admixture; an explosive mixture is, *he should think*, 1 part of gas and 7 of air; and when asked, "When does it cease to be explosive?" his answer was, "*I think* at about 15;"—that is, 15 parts of atmospheric air to 1 of fire-damp. Mr. Dickinson in his answers was only giving the Committee at second-hand Mr. Buddle's evidence in 1835, and was merely *guessing*, without any thing like scientific accuracy, at the results of Sir Humphry Davy's experiments, published in the *Philosophical Transactions* of 1815, 1816, and 1817. We confess we should have expected that Mr. Dickinson would have been better informed on this matter, either from the results of personal experiments, or by reference to those of Sir Humphry Davy, or by both. We regret that the information which Mr. Dickinson supplied to the Committee was so very defective, throwing no new light whatever on the subject; as, after an interval of nearly 40 years, which have witnessed a marvellous advance in philosophic knowledge, much might have been anticipated from more accurate analysis and more perfect apparatus. Specimens of fire-damp had been sent from several collieries to that celebrated chemist at that period, for examination and experiment, and he found that the pure subcarburetted hydrogen, commonly called "fire-damp," requires twice its bulk of pure oxygen gas to consume it completely; and that it would, for the same effect, require about ten times its bulk of atmospheric air, as this volume of air contains about two volumes of oxygen. Ten volumes of atmospheric air, therefore, mixed with one volume of subcarburetted hydrogen gas, or fire-damp, form the most powerfully explosive mixture. If either less or more air be intermixed, the explosive power will be impaired, until 3 volumes *below* or 3 *above* that ratio constitute non-explosive mixtures—that is, 1 of pure fire-damp mixed with either 7 or 13, or any quantity below the first or above the second number, will produce an unexplosive mixture. Davy drew a conclusion that fire-damp would not explode when mixed with less than 6 times or with more than 14 times its volume of atmospheric air. Scientific men have been well acquainted for a long series of years with these results, but as the experiments which led to them would appear to have been made with gas brought in some instances from distant collieries, subject to the effects of time and carriage, and as Mr. Dickinson had ample means of procuring

fresh gas on the spot, and has at his command the improved appliances of modern science, we confess we would have been better pleased if he had enlightened the Committee by evidence of his own philosophical skill. According also to Davy, it is the carbon the fire-damp contains which enables it to emit more light during combustion than pure hydrogen: 100 cubic inches of fire-damp weigh about 17·2 grains, its specific gravity compared with atmospheric air is 0·554. It consists of 4·3 grains of hydrogen gas, combined with 12·9 grains of carbon. A most important fact seems, however, to have been wholly overlooked. Davy also ascertained that 1 volume of carbonic acid gas to 7 of an explosive mixture, composed of fire-damp and atmospheric air, deprived it of its power of exploding altogether.

We are aware that, in some collieries, the fissures in the coal resemble natural gasometers, and that even if a mine be cleared one day of inflammable gas, it often fills like a well the next. When, however, we know that carbonic acid gas is in artificial formation, the easiest procured of all gaseous product, and when we find that the injection of it in large quantity has been recently applied, with complete success, to extinguish fire in mines, it may not, perhaps, be a very extravagant speculation to suggest that it might be hereafter successfully combined, by a simple process, with the admixture of fire-damp and atmospheric air, so as to render that admixture unexplosive, and consequently harmless, provided the combination would not itself fatally affect the respiratory organs of human life. When we reflect upon the extraordinary and almost marvellous achievements which human perseverance and scientific skill have accomplished in our times, we see nothing to discourage the experiment as visionary or hopeless. The safety-lamp was itself the result of clear conception with careful and cautious investigation; it owes its present perfection to the improvement of time and experience, but still it has not proved a certain or complete protection. The Middle Dyffryn Colliery is a remarkable instance. That colliery had a furnace and steam-jet to produce the ventilation, but the explosions occurred from the gas igniting the furnace. The most judicious and circumspect use of the safety-lamp could not, therefore, have prevented the catastrophe, and some other mode must, consequently, be devised of averting the recurrence of so frightful a calamity in those cases of apprehended danger, to which the safety-lamp is inapplicable. The ancient Romans rewarded, with a civil crown, the man who saved the life of a single citizen: we venture to predict that, if the attempt which we suggest should be attended with success, the discoverer will, as a benefactor to the human race, deserve and receive a great reward from his country.

Mr. Herbert Francis Mackworth, another Government Inspector of Mines, was also examined before the Committee on the two points to which we have in our observations principally referred. There is something consolatary in his statements, for he gave the Committee to understand that, taking the number of lives lost in the coal mines of his district in 1851 and 1852, he found a considerable diminution in accidents in shafts, and in the number of explosions; accidents in shafts and explosions of fire-damp being those in which inspection would naturally have the most effect. In accidents from explosions there was, however, a considerable increase in the number of deaths, owing to 65 lives having been lost by one explosion at Middle Dyffryn. He further explained that the considerable increase in the number of deaths from "miscellaneous" accidents, was owing to an irruption of water at the Gwendreath Colliery, by which 26 lives were lost, and this accident occurred the same day as the great explosion at Dyffryn—10th May, 1852. As an Inspector, he very naturally takes credit for a diminution in the number of deaths in shafts in 1852 as compared with the year 1851, and also in the number of deaths from explosions in mines, and this he thinks to some extent must be due to inspection, because during this time there was a considerable increase in the quantity of coal produced.

THE COAL FIELDS OF THE UNITED STATES.

Under this title a statement of considerable pretensions has found its way into the public press. It is, however, defective, and affords a very imperfect view of the coal measures of the United States. We make room for it in these pages, that our readers may recognize the statement to which we refer:

The coal mines of the United States are of unknown extent, and incalculable value. The coal producing States are as follows, as stated in R. Taylor's well-known work:—Alabama has 3,400 square miles of coal; Georgia 150 miles; Tennessee 4,300; Kentucky 13,500; Virginia 21,195; Maryland 550; Ohio 11,900; Indiana 7,700; Illinois 44,000; Pennsylvania 15,437; Michigan 5,000; Missouri 6,000. Total square miles of coal in twelve States, 133,132.

Of this Illinois has the largest surface, being one third of the whole; but her mining lands are undeveloped. Illinois contains 43,960 square miles, equal to 28,134,400 acres. The greatest developments have been in the mines of Pennsylvania. The greatest amount of capital and labor has been spent on them, and in providing by canals and railroads conduits to market. These mines also have been in course of working the longest period. The areas in this State, occupied by anthracite, semi-bituminous coals, are equal to 9,879,680 acres; over one third of the superficies of Pennsylvania is covered by productive coal formations, a proportion more than three times greater, relatively, than Great Britain, the most productive of the European countries.

The production and use of coal in this country, is of very late date. The first anthracite coal found its way from Pottsville to Philadelphia, in the year 1812, only forty years ago; from the Lehigh region in 1814, from Wilkesbarre in 1820. The first bituminous coal reached tide-water down the Susquehanna only in 1804, less than half a century since.

In England coal has been consumed for fuel from the beginning of the thirteenth century. In Scotland only from the close of the last century. In France from the beginning of the fifteenth century; and in Belgium from the year 1198. The Belgian coal mines therefore are of the most ancient date, as to their working.

The coal of Pennsylvania lies on the surface, or nearly so, an advantage which the coal of Europe does not possess, as that has to be dug out from very low depths.

The strata of the great bituminous coal region of the Alleghany Mountains closely approximates to a horizontal state; no coal region in the world offers more ready facilities for cheap mining than does that of Pennsylvania: where it is found rather on the surface, or at a very insignificant depth below it. The great Alleghany or Appalachian coal field extends through eight States, 750 miles long and 173 broad at its greatest breadth, but averaging a breadth of 85 miles, giving an area of 65,000 square miles of bituminous coal.

The three divisions of the area of anthracite coal formations in Pennsylvania are—

	Square Miles.	Acres.
The Southern or Schuylkill Coal Region	364	104,960
The Middle Coal District, including the Mahony and Shamoken, to the Lehigh	115	73,600
Wyoming, Wilkesbarre, and Lackawanna, or Northern Region	118	75,520
Total area	397	254,080

The most southern coal field of Pennsylvania is that of the Dauphin, which abuts on the Schuylkill at Port Lyon or Dauphin, and is connected with the Pennsylvania Central Railroad, and with the Schuylkill Canal, and has an outlet to tide-water at Havre de Grace. This is the least developed of the coal regions of Pennsylvania, but will be found quite as rich as any when more fully worked. The approaching connection by railroad to join the Reading Railroad, will give it also a northern outlet. We have, therefore, east of the Alleghanies, first, the west and northwestern section, including the Wyoming coal field and

Lackawanna region. We have, secondly, the middle region, the Shamokin Basin east of the Mahony Mountain; thirdly, the great Schuylkill region, the centre of which is Pottsville, which puts its coal in circulation by the great Reading Railroad; and, fourthly, the Dauphin region, which stretches in a direction from southeast to northwest, and joining the Schuylkill.

The companies working the mines combine the double object of mining and transporting coal. The obvious distinction between carrying and producing is not maintained as separate business. The Lackawanna and Pennsylvania coal companies draw their supplies from the northernmost wing of the coal field, Wyoming.

The Reading Railroad Company, the Schuylkill Navigation Company, the Lehigh Company, all occupy the Schuylkill and Middle Coal regions; while the Dauphin Coal Company works its own estates in the southeastern portion of the coal field, but towards the Southern market of Baltimore.

These facts are worth preserving for future reference.

CALIFORNIA COAL.

The Sacramento *Union* describes some specimens of coal taken from the foot-hills of the Sierra, in Butte county,, about forty miles above Marysville.

In external appearance it much resembled the more bituminous varieties of coal, breaking with a shining fracture; but as this coal was taken from near the surface, it could not be considered as a fair sample, and we have no doubt that more favorable specimens will be found. It was comparatively light, the specific gravity certainly not being so high as that of ordinary bituminous coal.

The vein in which it occurs is about six feet thick, crossing out with a dip of about 45 deg.; but at some distance in the hill, where a shaft of twenty-nine feet has been sunk, to intercept the vein, it is found nearly horizontal. It burns with a clear, bright flame. but appears not to have much strength.

COAL FOR FOUNDRIES.

There never has been a time in St. Louis, when there was such a scarcity of coal for foundries and iron manufacturers. Several of the former are closed, or almost so, and but few, if any, are working full time. The stock of Pittsburgh coal, which has heretofore been used for making coke, is nearly exhausted. The Gas Company's supply will scarcely hold out a month longer, and all the coke that Company can supply is not much more than a tithe of the demand. If there is no rise in the Ohio shortly, not only the iron manufacturers must suspend, but there is a strong probability that the city will be without light. It is singular that, situated as St. Louis is, in the midst of an immense coal field, no coal, in sufficient quantity, has yet been obtained of proper quality for either of these purposes.

Coal of the ordinary kind is now commanding 16 cents per bushel, too high by at least a half.—*St. Louis Republican.*

NEW METHOD OF COALING STEAMSHIPS.

A plan has been adopted at the Sheerness dock-yard, by which a considerable saving in labor will be effected in sending the coals into the hold, fore and aft, by an ingenious process, invented by Mr. Robert Lawes, the storekeeper, which consists of shifting shoots attached under the hatchways, which can at pleasure and with dispatch be made to convey the coals either forward or aft, starboard or port; so that no trimmers are required in the hold. In addition to this, the coals are eased into the hold on an inclined plane, whereby they retain their size—an object most desirable in such fuel. The *John*, Potter master, from Wales, in discharging, availed herself of a new mode, adopted also by Mr. Robert Lawes, by which the discharge will be expedited quite 40 per cent., and with less labor than heretofore.

IRON AND ZINC.

IRON MANUFACTURE IN PENNSYLVANIA.

The latest returns which we possess of the extent of the Iron manufacture of Pennsylvania were taken in 1850. These show the following surprising results, which are doubtless considerably below the extent of this business at the present time.

First. Eastern Pennsylvania.

	NUMBER.	INVESTMENT.
Anthracite Blast Furnaces	57	$3,221,000
Hot Blast Charcoal "	67	2,867,500
Cold Blast " "	60	2,356,500
Bloomery	6	28,700
Forges	118	2,012,300
Rolling Mills	56	3,128,700
Total	364	$13,614,700

Of the Anthracite Blast Furnaces, the largest product was 151,331 tons; actual make in 1849, 109,168; annual capacity, 221,400; men and boys employed, 4,225; the kind of ores used were Brown Hematite, Magnetic, Fossiliferous Red Oxide, Carbonate and Bog Ores.

Of the Hot Blast Charcoal Furnaces, the largest product was 77,860 tons; actual make in 1849, 46,336 tons; capacity 101,475; men and boys employed 4,694.

Of the Cold Blast Charcoal Furnaces, the largest product was 52,231 tons; actual make in 1848, 29,697 tons; capacity 69,524; men and boys employed 3,185.

Of the Bloomery Forges the number of fires was 12; largest product 545; actual make in 1849, 335 tons; men and boys employed 97. These forges all used the rich Magnetic ores of New-Jersey, and consumed about 3 tons of ore and 15 cords of wood to the ton of bars produced. The average annual capacity was 50 tons per fire, which for the 12 fires in the State would give 600 tons of bars, consuming 9000 cords of wood and 1800 tons of ore.

Of the Charcoal Forges, the number of forge fires was 389; the largest product of Blooms, 32,737 tons; of bars 6,880 tons; actual make in 1849, 24,349 tons of Blooms, and 3,946 tons of bars; men and boys employed 3,065.

Of the Rolling Mills, the number of Puddling Furnaces was 247; Heating Furnaces 164; Nail Machines 276; Bituminous Coal consumed 1,126,500 bushels; Anthracite Coal consumed 140,707 tons; tons of Pig Iron 87,521; Blooms 17,717 tons; Scrap 3,905 tons; largest product 91,598 tons; men and boys employed 3,648.

Second. Western Pennsylvania.

	NUMBER.	INVESTMENT.
Raw Bituminous Cold and Hot Blast	7	$ 223,000
Coke and Hot Blast	4	800,000
Charcoal and Hot Blast	18	611,000
" and Cold Blast	85	2,813,876
Forges	3	14,000
Rolling Mills	23	2,425,500
Total	140	6,887,376

Of the Raw Bituminous Coal and Hot Blast Furnaces, the largest product was 7,800 tons; actual make in 1849, 4,900 tons; capacity 12,600; men and boys employed 515.

Of the Coke Hot Blast Furnaces, the largest product was 10,000 tons; capacity 12,000; bushels of coal consumed 1,120,000; men and boys employed 900.

Of the Charcoal Hot Blast Furnaces, the largest product was 16,659 tons; actual make in 1849, 11,966 tons; capacity 29,230 tons; men and boys employed 1,310.

Of the Charcoal Cold Blast Furnaces, the largest product was 72,924 tons; actual product in 1849, 50,968 tons; capacity 104,180 tons; men and boys employed 5,353.

Of the Charcoal Forges, the number of fires was 5; largest product 380 tons; men and boys employed 42.

Of the Rolling Mills, the number of Puddling Furnaces was 187; number of Heating do. 128; number of Nail Machines 330; bushels of Bituminous Coal consumed 5,864,300; cords of wood 900; tons of Pig 73,266; do. Blooms 10,830; do. Scrap 5,200; largest product 72,132; men and boys employed 3,010.

LAKE SUPERIOR WROUGHT IRON MANUFACTURED UNDER RENTON'S PROCESS.

Renton's new process for making wrought iron direct from the ore, we are pleased to learn is continuing to work with increased success. A quantity of the Lake Superior ore was sent by the Cleveland Iron Company to Cincinnati, to be manufactured into iron by the new process in a furnace built by W. C. Davis & Co., under the superintendence of the Patentee.

On Thursday the trial was made, and in six hours produced 1,249 lbs. of blooms from 2,436 lbs. of ore; a portion of the iron was rolled into bars, producing an article remarkable for toughness. A piece of 1 1-4 inch round bar was bent over cold under a 6,500 lb. hammer, and so flattened down that the two inside edges came completely together all the way, without showing the least crack or break on the end. This is one of the severest tests, and none but very good iron can stand it. A portion also rolled very well into wire rods.

We have the best authority for saying that on Saturday Mr. Renton's furnace made in nine hours and twenty minutes 2,470 lbs. of blooms out of 5,860 lbs. of ore, chiefly of the Ohio and Virginia limestone ores, 1,566 lbs. of which, however, was the Lake Superior ore, mixed with a portion of the Ohio and Virginia, which yielded well and worked very fast, turning out about 400 lbs. per hour, and which made very tough iron. This process economizes fuel, as by measurement it only takes one and a half tons of mineral coal to make a ton of bloom The Ohio ores by this mode will yield about 40 per cent., and the Lake Superior ore from 50 to 60 per cent. These statistics show this new process to be a very important improvement in the manufacture of wrought iron, a vast saving being made in substituting mineral coal or wood for charcoal, which must bring into requisition vast quantities of lands that lay useless with the wood swept off for charcoal, although abounding in bituminous coal, which could not be used for working the hematite ores. The main features of this improvement consist in reducing the cost of a ton of iron, improving its quality, saving the cost of the pig metal process, and consequently a large amount of capital requisite to work the blast furnace, this mode requiring comparatively but a small outlay.

The cost of manufacturing one ton of iron from Lake Superior ore, at this point, we give as follows:—

Labor of three men	$6 00
Two tons coal, $1 50	5 00
Hammering into Blooms	1 00
Burning and stamping ore	1 00
Filling tubes	25
Cost of powder	1 50
Making into muck bar	75
Including all contingencies—Merchantable bar	6 00
	$21 50
When the Canal at Sault Ste. Marie is completed, and Railroad from the Mines to the Lake, two tons of ore, which will make more than a ton of iron, will cost $6 per ton	12 00
Total	$33 50
Present value of Iron per ton	80 00
Net profit	$46 50
Additional, for present cost in transportation of the ore	12 00
Net profit	$34 50
Cost of the ore made into Blooms when Canal is finished	26 75
Present cost added	12 00
For one ton of Iron Blooms made at this point	$38 75

Cleveland Herald.

IMPORTATIONS OF BAR IRON, MANUFACTURED BY ROLLING, INTO THE UNITED STATES.

We annex an official statement, showing the quantity, total value, cost per ton, &c., of bar iron, manufactured by rolling, imported into the United States in each of the past eight years:—

YEARS.	TONS.	VALUE.	AVG'E COST.	DUTY.	DUTIES.
1844	37,891	$1,065,582	$28	$25	$ 947,280
1845	51,188	1,691,748	33	25	1,279,715
1846	24,108	1,127,418	47	25	602,720
1847 (5 months)	8,098	484,816	54	25	202,460
1847 (7 months)	32,085	1,695,173	53	30 p. c.	508,552
1848	81,589	3,679,598	45	30 "	1,108,879
1849	173,457	6,060,068	35	30 "	1,818,020
1850	247,951	7,397,166	30	30 "	2,319,150
1851	254,310	7,323,283	29	30 "	2,197,285

In putting down the average cost per ton in this table, we have left off the cents and put down the price nearest the fraction.

MOUNT SAVAGE IRON WORKS.

The repairs to the Rolling Mill and other works of the Mount Savage Iron Company at this place are going on rapidly, and it is supposed that in two weeks the manufacture of rails will be again commenced. In the mean time the Company have laid in an immense stock of iron ore for future consumption. It was obtained from Messrs. Percy & Co., the lands of the Frostburg, Borden, and New-York Companies, from Wills Creek, from Braddock's Run and the vicinity. The ore is said to be the best hematite, and the stock is supposed to be large enough to supply the mill for more than a year and a half. We see no reason why the splendid works of the Mount Savage Company should not manufacture all the rails that will be needed by the various railroads that are in process of construction in all this region of country.—*Cumberland Journal.*

THE SWEDE IRON COMPANY.

This Company is erecting a new furnace, and constructing a railroad 14 miles to their ore mines, together with all the necessary improvements for one of the most extensive iron establishments in the Schuylkill Valley. It is located on the Reading Railroad, a short distance below Norristown, with lateral railroads to transport their iron ore, coal, and limestone, to the mouth of their furnaces. This improvement will cost $100,000, and, when in full blast, will give employment to two hundred and eighty men, and turn out weekly two hundred and twenty-five tons of iron.

SHARON IRON COMPANY.

The *Erie Gazette* states that the Sharon Iron Company have commenced the building of a pier at the harbor connected with that place. An extensive rolling mill and other buildings necessary to the complete character of the projected establishment are to be erected.

This Company, located in Pennsylvania, is the only one there, we believe, which uses the Lake Superior ore.

MANUFACTURE AND IMPORTATION OF IRON.

The details of the subjoined statement of iron manufacture and importation in this country furnish grounds for reflection. If the value of all kinds of imported iron continues to increase, notwithstanding the increased manufacture

the question may well be asked, what limit is there to the demand for the article? If the raw material is so abundant, the demand so great, and coal so much cheaper than in England, what shall hinder our skill and industry from controlling our own iron market?

Strange to tell, although the manufacture of all kinds of iron in the United States has already been enormous, yet the value of all kinds of imported iron continues to increase. In 1821, it was $1,213,000—in 1850, it was $9,154,000, and in 1851, it was $9,000,000. Why cannot the railroad iron used here be also made here—or rather, why is it not? Still the United States iron manufactures are large.—Look at the subjoined, from the census of 1850, and remember that there has since been a great increase:—

PIG IRON.

Capital invested in manufacture	$17,348,000
Raw material consumed	7,000,000
Cost of labor	5,966,000
Value of products	12,740,000
Hands employed	20,458

CAST IRON.

Capital invested in manufacture	$17,456,000
Raw material	10,846,000
Labor	7,000,000
Value of product	25,000,000
Number of hands	20,507

The principal iron State of the Union is, as we all know, Pennsylvania; and she has the following, which are always on the increase, or with common enterprise ought to be:—

	No. Iron Works.		No. Iron Works.
Berks County has	41	Chester	25
Lancaster	30	Venango	21
Clarion	30	Columbia	20
Huntington	28	Centre	20
Blair	27	Armstrong	18

The following is the amount of fixed capital invested in that business in ten counties:—

Alleghany	$1,837,000	Columbia	$1,107,000
Armstrong	1,888,000	Blair	922,000
Lancaster	1,278,000	Huntington	896,000
Chester	1,248,000	Luzerne	702,000
Berks	1,201,000		
Clarion	1,221,000		$11,835,000

And yet, with all these advantages, there was last year a great augmentation of imports, not only of iron, but also of iron and steel manufactures, chiefly from England. The following is the value of iron and articles which are wholly or in part composed of iron, imported into the United States in 1851 and 1852:—

	1851.	1852.
Pig	$ 950,000	$ 1,142,717
Railroad	7,397,166	10,650,181
Manufactures of Cast	1,437,133	1,219,202
Manufactures of Wrought	2,278,089	3,460,112
Manufactures not specified	3,427,180	2,319,280
Cutlery not specified	1,274,838	1,606,158
Other manufactures, composed of steel in part,	668,851	916,889
Old	202,090	311,444
Total	$17,635,507	$21,626,993

In addition to these details, about 30,000 men are employed in iron castings. and 25,000 in the manufacture of pig iron. In wrought iron about 14,000 hands are employed.

We add to the above the following account of the imports of railway iron at New-York from January 1st to August 13th, for the two years:—

	1852.		1853.	
IMPORTS.	BARS.	VALUE.	BARS.	VALUE.
January 1 to March 31	126,792	$457,111	124,682	$ 909,943
April 1 to June 30	76,569	311,146	234,288	1,780,575
July 1 to August 13	85,960	366,029	74,162	565,461
Total . . .	289,321	$1,134,286	433,132	$3,255,979
			289,321	1,134,286
Increase			143,811	$1,121,693

Some idea of the relative prices, this year and last, may be gathered from the great disproportion between the increase in quantity and the additional value. During the first quarter of 1852, the average value of the bars received, was $2 60, while, during the same period of the current year, the average was $7 29; an increase of over 100 per cent.

IRON MANUFACTURES OF AUSTRIA.

The exhibition of Iron manufactures in the Austrian department of the Crystal Palace, contains some articles of interest. These are so well described in connection with some statistics of the Iron manufacture of that country, that the account of them finds a very appropriate place in the pages of this Magazine:

Rich as is the Austrian monarchy in mineral resources of every description, the most important of all the various branches of its mining wealth and industry, is that of Iron—whether we consider the extensive development it has already received, or the still more encouraging prospects of its future enlargement, which only requires proper care to be devoted to it, and the many mistakes which at present attend its management to be abandoned. The pig iron of Austria is smelted in 257 blast furnaces; so that on an average, more than 12,500 cwt. are the produce of these works annually. The cast-iron is run for the most part, direct from the blast furnace into the moulds. Iron of second casting is produced in thirty-seven cupola and nine reverberatory furnaces, and is less, considerable, in quantity. The figures above given are very little disturbed by the fluctuations of trade; for during the period from 1843 to 1847 the imports of iron ore and pig iron, including scrap iron, were on an average respectively 50,381 cwt., and 24,557 cwt.—the exports of iron ore being 9,078 cwt., and scrap iron 5,110cwt.; consequently these amounts exercise no perceptible influence upon the finishing manufacture of the pig iron into bar iron and steel. The production of malleable iron, including the amount yielded by all the various methods and processes applied to different kinds, and for securing different degrees of fineness, exceeds two millions cwt. annually. The production of steel amounts to 287,300 cwt., which is made up of the following proportions:—Cast steel, 4,200 cwt.; keg steel, 75,000 cwt.; sheer steel, 54,000 cwt.; crude steel, 150,800 cwt.; blistered steel, 2,500 cwt. The manufacture of this quality of steel requires the conversion of 368,000 cwt. of pig iron, still leaving upon the whole yield of the latter, a surplus of 201,000 cwt., which are melted down in the cupola and reverberating furnaces. The balance of trade in malleable iron and steel, is in favor of Austria, the exports showing an enormous annual excess over the imports.

Of the different branches of the iron manufacture carried on in Austria, the most important from their magnitude, are those of scythes, sickles, chaff-cutters, and wire rails. Of these, immense quantities are exported to different parts of the continent, and even find their way into Turkey and Syria. There are 179 scythe factories, which produce annually 3,000,000 of scythes, 1,600,000 sickles, and 90,000 chaff cutters, valued at 5,000,000 of florins. The manufacture of wire is carried on in 100 establishments, producing about 80,000 cwt., valued at

1,364,000 florins. The manufacture of nails amounts to about 50,000 cwt., valued at 970,000 florins. The smaller workshops appropriated to other manufactures in iron, produce files, knives, hatchets, shovels, sword-blades, gun-barrels, and various other articles, to the value of 4,800,000 florins; give employment to more than 60,000 persons, and support 150,000 individuals, including the members of the families of those employed.

From what we have just stated, it would naturally be expected that the contributions in iron work sent by Austria to our exhibition, should be rather of a useful than of an ornamental character. With one or two exceptions, this is the fact. Most of the articles exhibited are specimens of scythes, sickles, kitchen utensils, nails and cutlery of every description. The exceptions are a magnificent cast-iron candelabrum, about twenty feet high, and some beautiful specimens of ornamental fire-arms. The first named is from the foundry of Prince Von Salen, at Vienna, and is well worthy of inspection. Unlike many works of this nature which we could point out, the design is exactly adapted to the purpose for which it was intended, and it has consequently a light and elegant appearance. It is massive where it should be, at the base, and gradually tapers off to the apex of the column, the ornamentation merely performing a secondary part, and relieving instead of overloading the general effect. As a specimen of iron casting, it is one of the finest that we have seen, and is fully equal to the best of castings contributed by the Coalbrook Dale Company to the London Exhibition. The ornamental fire-arms shown by Nowack, of Prague; Kierner, of Pesth; and Schaschel, of Ferlach, are exquisitely finished, an infinite amount of pains and elaboration having been evidently bestowed upon them. We cannot, of course, speak as to their efficiency, but they seem to us to combine all the recent improvements. The agricultural implements are light and convenient in form; but they are wanting in that burnish and careful finish which we love to bestow on all such articles. The same remark applies to the cutlery and hardware; but it should be borne in mind that all the specimens exhibited in these branches of manufacture are recommended rather for their cheapness and utility, than for mere showy qualities. We must therefore test them by a standard which it was never intended to submit them to. To carry out the object of the exhibitors, however, the prices ought to have been affixed to each article, as a sort of special catalogue, prepared for the visitor to refer to. It has always appeared to us to have been a great mistake on the part of the Executive Committee of the London Exhibition, and it no doubt is the same on the part of the Directors of our own, not to permit the exhibitors to give as prominent an effect as possible to this element of cheapness. It is one of the most important features of the competition to which the manufacturer is challenged; and it is doing him an injustice to debar him from an opportunity of placing it prominently before the public. No where have we been more forcibly struck with the truth of this remark than in the department of which we are speaking. To the person who merely bestows a superficial glance at the collection, without reference to its character and objects, the first impression is naturally that of disappointment. He inquires of himself what could have been the motives of the exhibitors to place articles such as he beholds, in competition with the English and American hardware. When told, however, that they are merely sent as specimens of the low price at which really good and useful articles can be produced, when unnecessary work is dispensed with, his interest is at once awakened, and he finds in these Austrian manufactures, articles that can be advantageously placed in competition with the same class of goods in any of the other departments. We regret to perceive that some of the cutlery has got damaged, either during the sea voyage, or since its arrival in the building. The oxidation of the blades, caused by exposure to moisture, naturally detracts very much from the appearance of the goods. The chief places at which this branch of manufacture is carried on, are Steinbach, Waldhofen, Stadt Steyer, Sierminghofen, Neuzeny and Grunberg—all in Austria proper. Samples of iron, brass and general hardware, of every

primitive but substantial and useful character, are also exhibited, for the purpose of showing the low prices at which these articles can be produced. Some fine specimens of files and other tools, are shown, which, for temper and quality, will bear comparison with those of any other country. The samples of wire, nails and tacks, from the works of Count Dubsky, in Bohemia, are exceedingly curious, some of them being so small and fine as to puzzle one as to their uses. The wire nails seem to be pointed by four cuts of a machine, and they have the improvement of the screw thread near the head. These nails are very much superior to the common iron ones, in tenacity, and it is surprising that they do not come into more general use. In short, the iron and hardware section of this department will well repay the inspection of the visitor, the forms of some of the instruments and tools being very peculiar, and the quality of the articles in general excellent.

RHENISH CHARCOAL IRON AND STEEL COMPANY.

The circumstances which led to the formation of this company in England are worthy of consideration among ourselves. If iron is an article of such value and demand, the finer kinds should amply repay the capitalist who is devoted solely to their manufacture:

The formation of this company is justified by many circumstances familiar to persons conversant with mechanical pursuits. The demand for British iron during the railway movements led the ironmasters into the practice of turning out iron rapidly without much consideration for its quality. The demand continues for exportation to many countries, and all the iron which our furnaces can supply is purchased at good prices; but the finer class of iron manufactures cannot be successfully conducted with this second class material. The superiority of iron smelted with vegetable fuel is perfectly well known; and the advantage is more perceptible as the metal rises in quality. For example, the famed sword blades of former times were made of steel, refined in small furnaces, with vegetable fuel. Biblical antiquaries dispute the question whether the Syrians had or had not coals. We incline to the opinion that they possessed this kind of fuel; and at the present day coal is found near the surface of the soil, in the Lebanon; but the sabres of Damascus were not formed with coal from the mine, but fuel from the forest. In some districts of this country turf has been occasionally used in iron furnaces, at a great additional cost, but with much advantage to the quality of the metal. We believe that money might be made by bringing the ore to the peats, or the compressed peats to the ore, still; for we greatly want high qualities of iron and steel for numerous purposes. A manufacturer of carriage springs will pay the highest necessary charge for fine metal. All the iron work on railway carriages should be formed from the best, which for this purpose is the toughest material. Life has been frequently lost by a flaw in a spring, or in a wheel, which may have been imperceptible on a casual examination. The employment of charcoal iron for any part of machinery on which a very heavy pressure is occasionally or regularly laid, is desired by the best practical mechanics. They cannot procure iron too fine for their purposes; and they are willing to pay a fair price for the article which they need. We should suppose that boiler plates alone would consume a greater quantity of this iron than can be obtained at present; but without speculating on subjects of that nature, we know that the demand for steel alone exceeds the supply. The reason is, obviously, that charcoal iron and steel are not easily procured. The Swedish forests are not burned down, and the Swedish mines are not run out, but their situation greatly enchances the cost. This company proposes to establish works on ground already tried, near the Rhine; and, therefore, now with steam on land and water, not far from Birmingham, Sheffield, or Glasgow; not greatly removed from the Thames or the Tyne, which have great machine shops on their banks. The capital of the company is nominally £60,000, in that number of shares of £1, but only half the amount will be called for. They have

got possession of some works that have been in partial progress, and considerable tracts of mineral ground; the rent charged for the latter is 5 per cent. on the gross, in one instance, and the same on the net profits in another. For the lease of the mineral ground and the plant of the works £500 is to be paid in cash, and £20.500 in shares of the company. The propriety of establishing iron and steel charcoal works in any district obviously depends upon the supply of charcoal which can be procured in the quarter. The price in the neighborhood of the mines is 25 dollars per 3000 lbs. The present cost of iron and steel at the works is £7 to £9, and the present selling price is £15 to £20; so that a clear profit of £5 per ton on the iron made may be reasonably expected, and as the smelting of iron might be at any time commenced, the distribution of profits could also commence at an early date. The cobalt occasionally found in iron mines is not detrimental in the neighborhood of the Rhine, but is, on the other hand, extremely profitable. The report of Captain Remfry, of Stolberg, on this property, states that it is placed in the valley of the Sieg, 55 miles from the Rhine, wrought by a fall of the river, in a country where charcoal abounds from the extent of the forests, and is sold from 20 to 25 or 28 dollars per 3000 lbs. He therefore places the cost of

8,100 lbs. ore at 11 Prussian dollars	£1 13
3,000 lbs. charcoal at 25 "	3 15
	£5 8
Producing 2,700 lbs. of charcoal iron, of which the price is 48 dollars	£7 4
Allowance for manufacturing	1 16
The price of bar iron in that part of the country is per ton .	10 16

QUARRIES AND CLAYS.

DRUMMOND'S ISLAND QUARRY.

The new limestone quarry opened on Drummond's Island, about 50 miles below the Saut, is more than realizing the highest anticipations of the quarrymen. At first it was feared that the stone did not lie in strata sufficiently thick for the heaviest lock stone, but on clearing off the lower surface stone, the strata are found of any required thickness and of an even, uniform texture and hardness. The strata is of a clear light gray color, specific gravity 169 pounds to a cubic foot, being 8 lbs. heavier than the Marble Head or Malden limestone.

Work has been commenced on a kind of table stone about fifty feet above the water and a hundred feet back from the water. The layers are level as a house, floor and the blocks are split out with the greatest facility. About 350 feet in length and 100 feet in width of this rocky floor have been opened, and a more beautiful display of unhewn blocks of stone we have never seen. The lines of stratification are parallel and the surface smooth, and the stone is split up easily. We believe the same number of men could quarry twice as many of these blocks in a day, as they could in ordinary quarries.

This quarry is situated on the north side of Drummond's Island, about ten miles east of the De Tour, in a beautiful bay, and easily accessible for vessels of all classes. This stone, while it is free from fossils, is not too hard to be easily grained and washed. We predict that this locality will become, very soon, noted for the best limestone quarries on the whole chain of lakes. It is on the great highway, by water, to Chicago, the Saut, and the other towns of Lakes Michigan and Superior, where it will be much needed in a few years.

BUHR STONES.

Up Galena River, at Tuttle & McLeer's Mills, the extensive quarry of blue or fossiliferous limestone, underlying the stratum of magnesian lime, attracted our attention. Here is a deposit of rock, the outcrop of which is of a beautiful blue or nearly black color, capable of taking a high polish—a most admirable material for building purposes. It seems to have been—though only *four* miles from the city—most strangely neglected. It is superior for most purposes to half the marble sold in market. The supply is inexhaustible.

In the mill, Mr. Tuttle showed a pair of "buhr stones," of his own manufacture from material found on the Wisconsin River. These buhrs have been running now more than two years, and have proved to be superior to the best French buhr stones, in every particular. Tuttle & McLeer own the land on the Wisconsin River, in which the raw material is found in the shape of boulders, some of which, unlike the French, are of sufficient size to make a mill-stone five feet in diameter. With the exception of an article of very inferior quality, which is found at Athens, Ohio, all the material for mill stones is imported. A pair of French buhrs cost $150 *a* $180. It is the intention of the gentlemen who own the Wisconsin quarry to manufacture stones for market. They have so tested the rock that they are well satisfied that it is equal, if not superior, to that brought from abroad. They own eighty acres of land with a boulder on every square yard.—*Correspondence Galena Jeffersonian.*

MISCELLANIES.

GARDINER'S CRUSHER AND AMALGAMATOR.

This machine is designed more strictly for crushing quartz rock, and amalgamating the gold it may contain with quicksilver. Several experiments have been made to test its success, which have given satisfaction to the spectators. It is not easy to describe this machine in a few words. A large basin contains the balls which revolve. The weight of the basin in some instances exceeds five tons, and the balls weigh one and two tons.

Notwithstanding this enormous weight, the machine is so well conceived and nicely adjusted as to be easily set in motion, and worked with a comparatively slight power. The whole moving portion of the machine is sustained upon a single hook of adequate size, and swings to and fro, the balls alone revolving, with stability and quietness.

ENGINES FOR MINING PURPOSES.

We noticed at the exhibition of the Franklin Institute, in Philadelphia, one of Archambault's engines for general mining purposes, pumping, hoisting ores, &c., which received the premium medal of the Institute on a former occasion. They seem to us well adapted for the objects desired, and have also the great advantages of portability and economy in the working.

THE NEW ASSAY OFFICE.

This work is going forward with energy; and expectations are entertained that it will be completed in about three months, unless something unforeseen should occur. The building, which is situated directly in the rear of the old United States Bank, will be a very substantial structure, four stories in height, besides the basement, built upon the most approved plan, with iron roof and beams, and essentially fire-proof. It is now up about two stories. Dimensions on the ground, seventy-five by thirty-two feet. The floor beams are of wrought

iron, on a new plan, being much like an H rail. Several builders have already taken drawings and measurements, with the view of imitating them. The roof will also consist of iron bars, overlaid with some incombustible material.

The Assay Office will have a huge stack or chimney, 144 feet in height, lined with fire-brick; and by means of the furnaces an intense heat will be generated in them, so as to effectually consume all the offensive gases which would otherwise be thrown off into the atmosphere. The basement and first story of the building are of cut stone—all the superstructure brick. Included in the various apparatus connected with the establishment will be a fine steam-engine of eight or ten horse power; a crushing-mill for pulverizing the dross or scoria; an improved hoisting-machine for raising heavy articles from the basement to the upper stories; twelve or fourteen furnaces, to be located in the first story and basement, and to form two distinct sets at either extremity of the building, one of which will be for refining gold, and the other for silver. The hoisting machine, the crushing-mill, and other machinery that may be introduced, will all be propelled by the steam-engine, which will also be employed to distribute hot air through the offices, and especially to expel the impure acid gases, which rise to the third story, from the building. The furnaces before alluded to are to be constructed on a new plan, acting on the blow-pipe system; and anthracite is to be used as a fuel, instead of charcoal, as at New Orleans and Philadelphia, which is far more expensive. The arrangement of the building is to be as follows:

Basement, for engine, furnaces, &c.
First story, for melting and refining.
Second story, for the assay department.
Third story, for separating or parting metals.
Fourth story, for purposes not yet specified.

With the facilities here afforded, a vast amount of work may be accomplished. It is judged that ten or fifteen men will be employed in the Assay Office,—though the number is not definitely known,—one man being competent to make three melts in a day, of 1,600 ounces.

The bank building on Wall-street will be used for the Sub-Treasury. An elevated platform will connect it with the Custom-House. Without doubt, a strong effort will be made by our Representatives at the next Session of Congress, to secure the passage of the Mint bill; and in case of its success, a purchase of the property in the rear, extending back to Pine-street, will be made, on which to erect the proposed Mint. The appointments for the Assay Office have not yet been fully made. Besides the Assayer, Professor TORREY, is the melter, refiner, weigher, &c., with assistants. The works now in progress are under the superintendence of able men, one of whom has had extensive experience in the Mints of the United States.

The processes for which the present institution is established, may be described thus, briefly:—California gold will be first melted, purified with nitre (saltpetre), repeatedly skimmed, to remove earthy particles, and ladled out into a basin of water 2 or 2½ feet deep, to granulate the metal. In this form it is like snow flakes, that it may be acted upon by nitric acid, to separate the silver from the gold. The silver is precipitated through a strong salt brine, of a given strength, and afterwards washed and dried. In this form it is called chloride of silver, or horn silver, and only requires remelting to produce refined silver. The gold is also remelted, making fine gold. It then undergoes another melting process, mixed up with one part of copper and 9 of silver, or 9 of gold, which forms the standard of the United States coin. The metal is next run into ingots, about sixteen inches long, one wide, and half an inch thick, weighing twenty or thirty ounces. When stamped with "U. S." and their exact weight, they are ready for shipment as coinage.—*N. Y. Journal of Commerce.*

INDEX TO VOL. I.

FROM JULY TO DECEMBER, 1853.

ARTICLES.

PAGE

Analysis of Soils. By Andrew Ure, M. D., F. R. S. 235
Artesian Well at Charleston, S. C. By R. N. Lynch, D. D. 251
Blowpipe (The) and its use in Chemical Analysis 388
" " " " " 496
Coal Fields of Bristol County and Rhode Island. By President E. Hitchcock 582
Coal Lands of the Deep River Co. of North Carolina. Report of Walter R. Johnson 352
Considerations on American Mining Operations 605
Cost-Book System; its Principles and Practice 597
Copper and Iron Region of Lake Superior 261
Cumberland Coal Company's Report 35
Dolly Hyde Copper Mine. Report of Chas. T. Jackson 476
East Tennessee and Cherokee Copper Co. Report of J. D. Whitney 114
Elementary Geology 185
Explosions in Mines and Collieries, and Methods of Ventilation. By Robert Blackwood, of Kilmarnock 99
Geology of the Sierra Nevada, or California Range. By John B. Trask 6
Gold and Silver produced by the Mines of America from 1492 to 1848 219
" " " " " 365
Lead Mine near Northampton. Report of B. Silliman, sen. 256
Lycoming Iron and Coal Co. Report of Prof. J. T. Hodge 455
Manassas Mining Property. Report of B. Silliman, jr. 228
Mines and Mineral Resources of New England 23
" " " New York 109
" " " New Jersey 232
" " " Pennsylvania 347
Minnesota Mining Co. Report of 126

PAGE

Mineralogical Exhibition in the Crystal Palace, N. Y. 497
Mining Practice in Cornwall, England 378
Mining, Quarrying, and Metallurgical processes and products. By Sir H. T. De la Beche 331
Modern Geology 480
North Carolina Copper Co. Report of C. T. Jackson 44
Northampton Mining District 612
Origin of Coal Fields and the time required for their formation. Sir Charles Lyell 121
Quartz Mining Operations in California 144
Report on some North Carolina Mines. By Prof. C. U. Shepard 591
Shelburne Lead Mine. Report of James T. Hodge 27
Shelburne Lead Mine. Report of C. T. Jackson 245
Short Mountain Coal Co. in Lyken's Valley, Penn 468
Silver Mine of "Jesus Maria," New Leon, Mexico 570
Silver of Lake Superior 612
Silver of the Lake Superior Mineral Region 447
Various modes of working Coal in England, and an examination of the practice in different districts. By J. Kenyon Blackwell 559
Views on American Mines and Minerals. C. S. Richardson 489
Wheatly and Brookdale Mines. Report of H. D. Rogers 375

LAWS AND REGULATIONS RELATIVE TO MINING PROPERTY.

Act of Incorporation of the California Legislature 613
Act of Michigan authorizing the formation of Mining Corporations 150
Act of New-York " " " 260
Amendment to do 268
Act of the Pennsylvania Legislature for the

PAGE
Incorporation of Mining Companies.... 499
Amended Rules for the Management of Mines on the English Cost-Book system 48
Australian Regulations.................... 154
Decision of the Supreme Court of California on the Proprietorship of the Mines..... 399
Foreign Miners' Tax......... 154
Gold Fields Regulation Act of Australia.... 51
Legal Investigation of the Nature of a Mineral Substance........................ 395
Local Mining Laws in California.......... 53
" " " " 158
Local Mining Laws of Nevada Co., Cal.... 54
Mutual Rights of the owner of the soil and the owner of the minerals beneath..... 502
Miners' Rights to Real Estate in California. 56

COMMERCIAL ASPECT OF THE MINING INTEREST.

Boston Mining Share List................ 57
" " " " 156
" " " " 275
" " " " 402
" " " " 504
Fluctuations in Mining Stocks at Boston, in May, 1858.......................... 58
June, " 158
July, " 276
Aug., " 405
Sept., " 506
Fluctuations in do. in Boston for October... 619
Fluctuations in Mining Stocks at New-York 274
" " " " 402
" " " " 504
Import of Metals into New-York.......... 156
" " " 277
" " " 405
" " " 504
Mining Stocks............................ 617
" " in Boston.................. 617
Metal Trade of the United Kingdom for July, 1858.......................... 405
New-York Mining Stock Market.......... 56
" " " " " 155
" " " " " 278
" " " " " 401
" " " " " 508
Prices of Lead at Galena................. 61
" of Lackawanna Coal at New-York.. 61
Prospects of the Anthracite Trade......... 159
Rise in Mineral Land at Lake Superior..... 158
Supply of Anthracite Coal................. 59

GOLD, &c.

Annual production of Gold................ 277
Australian Gold Fields. How located..... 66
Australian Gold, purity of................ 281
Australian Gold yield for 1852............ 163
Australian Gold Fields, their permanency.. 409
Berdon's Crusher and Amalgamator........ 289
Brazilian National Mining Association..... 167
Buffum's Amalgamator.................... 289
California Gold yield to July 1852......... 278
Capital invested in California Water Comps. 621
Conrad Hill Mine, North Carolina.......... 628
Comparative yield of the Australian and California Gold Fields.................. 511
Cost of working a Quartz Mill............ 64
Dams and Flumes........................ 508
Deposits of California Gold in U. S. Mint... 620
Dorn Mine of South Carolina.............. 518
Effects of the Gold Act in Australia 510
Experience of Californians in Australia.... 627
Freehold Gold Mining Co.................. 167
Gardner's Magnetic Gold Washer.......... 287
Garnett and Mosely Mines, Virginia....... 164
Gold at Santa Cruz....................... 408
Gold Coinage of England.................. 277
" " France 278
" " United States.......... 278
" " " " for June, 1858 278
Gold Coinage in August, 1858............. 406
" " " for 1858........... 406
" " since 1793................ 407
Gold Deposits in South Carolina & Georgia 628
" Receipts and Exports from Melbourne 625
" Mines in Chihuahua, Mexico.......... 631
Gold Dust and Coin manifested from San Francisco, in six months of 1858....... 407
Gold in New Grenada..................... 284
Gold in Oregon.......................... 284
Gold Region of California.............. 62
Gold in Arkansas........................ 69
Gold Mines in Peru...................... 288
Gold in the Amazon............... 512
Gold Hill Mine, North Carolina........... 69
" " " " " 411
Gold Mining Company dissolved.......... 65
Helvetia and Lafayette Co................. 162
How the Great Gold Nugget was found.... 285
Increase of Gold.......................... 170
Increase of Gold in Australia.............. 624
Inexhaustibility of Australian Gold......... 62
Improvements in Gold Washers............ 690
" in operating on Auriferous Quartz, &c......................... 621
London and Virginia Gold Mining Co...... 167
" " " " " 418
Methods of Mining in California........... 160
Mining Operations in Australia during winter.................................. .. 626
Mining Region of Sonora, Mexico.......... 509
Mining in Quartz veins................... 507
Mokelumne Hill Canal.................... 160
" " " 279
Mokelumne Canal operations.............. 508
Minerals in Australia.. 411
New Method of Mining in Hill Diggings... 161
New Mining Canal........................ 623
Newton's Gold Washer.................... 258
New Zealand Gold Fields................. 68
" " " " 164
North Carolina Gold Mines............... 366
" " " " 518
Petrie's Patent Gold Refining Process...... 116
Production of Gold by artificial means..... 515
Production of Gold in the British Islands.. 629
Progress of Australian Mining Operations.. 409
Quartz Crushing Mill..................... 63
" " Mills in California........... 279
Quartz Mining in Nevada Co., Cal.......... 628
Reid Gold Mine.......................... 371
Russian Gold Mines...................... 629
Separation of Gold from Arsenical Pyrites.. 412
Sonora Tunnel Company.................. 280
Spurious and Curious Gold Specimens..... 66
Stock of Fluming Companies.............. 509
Tax on Foreign Miners.................... 623
Title to Mines in California............... 507
Value of Quartz Veins and Flumes in Cal.. 280
Virginia Gold Mines...................... 514
Water Companies' Convention, Cal......... 621
Yield estimated for different periods....... 277
Yield and Decline of Australian Gold...... 68
Yield of South American Gold Mines...... 514
Yield of River Claims in California......... 622
" in New South Wales District........ 625

COPPER, &c.

Adventure Mining Co.................... 174
Agate Harbor............................ 522
Albion Mining Company................. 414
Alloys of Copper......................... 70
Ancient Metallurgy....................... 180
Babbit's Metal........................... 298
Brass Founding.......................... [illegible]

	PAGE
Bruce Mine	417
Canadian Mining Licences	637
Cliff Mine	686
Coinage of Copper in U. S.	413
Consolidated and United Mines of Cornwall	179
Copper Falls Mine	73
" " "	171
Copper Mining in East Tennessee	292
Copper Rolling Mill	74
Copper Smelting	70
" "	420
Copper Trade of Great Britain	178
Copper in Jamaica, W. I	74
Derby Mine	173
Detroit and Waterbury Copper Smelting Works	298
Dolly Hyde Copper Company	74
" " " "	177
English and Australian Copper Company	296
Fire Proof Bronze Color for Copper & Brass	297
Forest Mining Co. Treasurer's Report	517
Fulton Mine	637
Improvements in Calcining certain Ores, and in the construction of Furnaces	420
Improvements in obtaining Copper and Zinc from their Ores	515
Improvements in obtaining Copper and other Metals from Ores	417
Isle Royal Mining Company	295
Lake Superior Copper Mine	72
The Cliff Mines	73
Manassas Copper Co. Report of Prof Paggot	176
Mines West of Ontonagon River	414
Minnesota Mine	683
Montreal Mining Company	520
National Mine	683
National Mining Company	73
New Mine at Ontonagon	684
New-York and Michigan Mining Company	515
North American Mine	687
North Carolina Copper Mines	74
North Carolina Copper Company	290
" " " "	522
Norwich Mine	518
" "	178
" "	634
Ohio Trap Rock Company	684
" " " "	178
Ontonagon Mining Range	682
Perkiomen Consolidated Mining Company	638
Portage Lake Co	295
Portage Lake Mines	415
Potomac Copper Co	522
Produce of Copper Mines of Cornwall since 1845	290
Produce of copper mines of Cornwall and Devon, England, in first quarter of 1853	71
Shawmut Mining Company	517
Springfield Copper Mine	688
System of Mining Operations at Lake Superior	293
Tennessee Copper Mines	175
Toltec Consolidated	173
Vanderburg Mining Co	174
Waterbury Mining Co	178

SILVER AND LEAD, &c.

Analysis of Ore of Lake Superior Silver Mine	300
Aucram Silver Lead Mine	75
Depositing Alloys of Metals	428
Desilverization of Lead by Zinc	530
Exhibition of Lead at the Crystal Palace, London	808
Extensive Lead Deposit	649
Great Northern Lead Mine	422
" " " "	77
Improvements in the separation of certain Metals from their Ores and other compounds	528
Lake Superior Silver Mining Company	189
" " " "	449
Lead Mine in Iowa	649
Middletown Silver Lead Mine	185
Missouri Lead Mines	525
Morris and Johnson's Metal Depositing Process	184
New Silver Coinage of U. S.	299
North, East, and Southampton Lead Mines	307
Preparation of pure Silver from Chloride of Silver	528
Produce of Lead in Great Britain	649
Production of Silver at different periods of the present century	299
Production and Prices of Lead in Galena	643
Production of Lead in the United Kingdom	303
Prospects for Mining Enterprise in Mexico	643
Plumbic Zinc; A new combination	429
Richness of Mexican Silver Mines	646
Silver Coinage in United States in fifty years	299
" " in England " "	299
" " in France " "	299
" " in June, 1853	299
Silver Coinage at Philadelphia	421
" " of United States Mints	422
Silver Coinage in Mexico	300
Silver Mines in Piqua Valley, Penn	646
" on Lake Superior	648
" Ore imported into England	648
Separation of Silver from other Metals	529
Shipments of Lead from Galena from 1841 to 1852	523
Shipments of Lead from the Northwest	77
Silver Mines in New Mexico	79
Silver Mines in South America	75
Silver Mining in Spain	75
Silver Mines of Potosi. South America	300
Silver Mines of Batopilos. Mexico	426
" " of Morelos "	426
" " of Chihuahua	423
Silver Mine of Jesus Maria in Mexico	423
" " Portenencia " "	424
" " Correlitas " "	424
" " Sangre de Cristo "	425
" " Setentrion	425
" " Urique	426
" " Monterde	426
Silver production of Spain	428
Silvering all sorts of Metals and Glass	429
Specular Galena	523
Southampton Mines in Massachusetts	79
The Market for Western Lead	648
Ulster Lead Mine	77
" " "	182
Ulster Lead Co. Statement of	523
Victoria Lead Company	526
Western Lead Mines	184

COAL, &c.

Anthracite Coal Trade for 1853	652
" for Locomotives	658
Analysis of Parker Vein Coal	311
Anthracite Coal Mine	309
Anthracite Coal Trade of U. S. from 1820 to 1852	80
Boring for Coal	657
California Coal	662
Coal Fields and Mines in the Western States	651
" for Iron Foundries	662
Coal Fields of Europe	314
Coal in Northern Oregon	197
Coal in Michigan	312
Coal mining in Prussia	312
Coal of Western Pennsylvania	83
Coal Fields of the British Islands	540
Coal Fields at the Cape of Good Hope	535
Coal transported by Reading Railroad	82
" " " " "	193
" " " " "	306
" " " " "	430

PAGE
Coal transported by Reading Railroad...... 531
Coal shipped by Schuylkill Canal........... 82
" " " " " 198
" " " " " 308
" " " " " 430
" " " " " 531
Coke as Fuel for Locomotives.............. 196
Colliery Operations. Lamps and Candles.... 586
Cumberland Coal Trade for 1858.......... 652
" " Basin.................. 652
Cumberland Region. Amount of Coal Shipped from.......................... 318
Cumberland Trade in 1851............... 83
" " " " 196
" " " " 308
" " " " 430
" " " " 532
Exhibition of Coals at the World's Fair, London.............................. 190
First Steam Engine in an American mine. 195
Freight of Coal from Nova Scotia..... . 431
Introduction of Anthracite Fuel........... 532
Investigations relative to Explosions in Collieries.......................... 659
Iowa Coal.................................. 197
Lehigh Coal Trade........................ 82
" " " 194
" " " 308
" " " 430
" " " 531
Large Lump of Coal.......................... 653
Llangollen Company........................ 532
Lonaconing Coal Works.................... 310
New Creek Coal Company's Report........ 431
New Method of Coaling Steamships....... 662
Origin of Coal.............................. 539
Price of Anthracite.......................... 430
Pennsylvania Coal Co...................... 535
Report of the Parliamentary Committee on Explosions in Collieries............... 536
Report of the Pennsylvania Coal Co....... 308
Receipts of Coal at Baltimore from 1845 to 1852.................................... 83
Rates of toll for Coal on Reading Railroad.. 531
" " " on Schuylkill Canal... 531
Schuylkill Coal Trade...................... 653
Scranton Coal Region...................... 83
Separating Foreign substances from Coal.... 538
Shipments of Coal from Richmond, Penn... 81
" " " " 194
" " " " 308
" " " " 430
" " " " 531
The Coal Business........................ 433
The Dorn Coal Company.................. 533

IRON AND ZINC, &c.

Application of Blast to Smelting Furnaces.. 199
Bar Iron, Manufacture by Renton's Patent. 202
Castings, Statistics of Manufacture of...... 89
Cost of British Pig Iron.................... 543
Forest City Iron Works.................... 542
Galvanized Iron............................ 543
Improvements in the Manufacture of Malleable Iron and other Metals............. 547
Improvements in the Manufacture of Wire. 547
" in Furnaces and apparatus for making Iron directly from the Ore.. 547
Improvements in the Manufacture of Iron. 546
Improved mode of heating air for blast furnaces.............................. 547
Iron, the method of its Manufacture 84
Iron Manufacture of Great Britain........ 320
Iron Manufactures in Morris Co., New Jersey 435
Iron Manufactures in Pennsylvania........ 663
" " in Austria........... 667
Iron of the Lake Superior Region.......... 198
Iron Ore in North Carolina................ 198
Iron Ore in Wisconsin...................... 543
Iron Works at Albany...................... 200
PAGE
Importations of Bar Iron into United States 665
Lake Superior Iron......................... 541
Lake Superior Iron Manufacture under Renton's Process........................ 664
Manufacture of Wrought Iron direct from the Ore.............................. 321
Manufacture of Iron for Nails.............. 86
Manufacture of Iron from Lake Superior Ores................................... 315
Manufacture and Importation of Iron...... 665
Marquette Works 198
Massachusetts Iron Works.................. 434
Mount Savage Iron Works 665
New Jersey Zinc Company................ 203
Pennsylvania and Lehigh Zinc Co......... 544
Pig Iron Manufacture in England.......... 202
Pig Iron, Statistics of Manufacture of...... 88
Products of Swedish Iron Mines......... . 203
Rhenish Charcoal, Iron and Steel Company 669
Sharon Iron Company....................... 665
Sheet Iron, Manufacture of................ 86
Swede Iron Company.................... 665
St. George Iron Mines, Savoy............. 545
The Mining and Manufacture of Iron in Great Britain and Pennsylvania............... 437
Use of Burnt Lime as a Flux............... 319
Veille Montaigne Zinc Co................. 439
Wrought Iron, Statistics of Manufacture of.. 90
Zinc and Manganes Ores of Arkansas....... 203
Zinc in Wisconsin........................ 87
Zinc Paint................................. 87

QUARRIES, CLAYS &c.

Buhr Stones................................ 671
Composition of the earthy mixtures of English Stoneware.......................... 550
Drummond Island Quarry.................. 670
Gardiner's Steam Drill.................... 215
Improvements in Artificial Stone.......... 440
Knight's Boring Machine................... 551
Lake Superior Marble...................... 551
Marble in Wisconsin....................... 205
Marble on the Yonyhoigheny River....... 205
Marble Quarries at West Rutland, Vt...... 91
" " in New-York............ 92
National Oil Stone 440
Natural and artificial Marble.......... 551
Porcelain, Its Manufactures and appearance in the American Exhibition............ 322
Southern Granite and Slate................ 93
Talbot's Boring Machine................... 552

MISCELLANEOUS.

Aerolites, Their Origin...................... 98
Almaden Quicksilver Mine, California..... 209
Analysis of waters of White Sulphur Springs, Va.................................... 441
Baker's Improved Steam Boiler Furnace.. 555
Brand's Liquid for Steam Boilers 327
Engines for Mining Purposes............... 671
Foreign Postage on Pamphlets and Magazines 95
Fossil Animal Remains in the West....... 207
Gardner's Crusher and Amalgamator...... 671
Gwynne's Reaction Centrifugal Pump...... 214
Gypsum 94
Human bones in solid Rock................ 553
Products of Prussian Mines................ 552
Seely's Patent Lime Kiln................... 554
Singular occurrence in a Mine............. 554
Sulphur Mine 212
The Eureka Diamond and Concomitant Circumstances 94
The New Assay Office.................. ... 671
Tin in New Hampshire..................... 552
Tin Manufacture of Great Britain......... 326
Tin Mine in South America................ 210
White Sulphur Springs of Virginia........ 441
Wire Ropes, Hemp Ropes and Chains..... [illegible]

1